CLASS IVb LANDFILL
PERMIT APPLICATION

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UTAH DIVISION OF
SOLID & HAZARDOUS WASTE

City of Logan

Environmental Department

December 2004

CITY OF LOGAN, UTAH
QUALITY OF LIFE AND PROGRESS

ENVIRONMENTAL DEPARTMENT

December 1, 2004

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Division of Solid and Hazardous Waste
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Included with this transmittal letter is the second submittal of the Class IVb Permit Application for renewal and expansion for the Logan City Construction and Demolition Debris Landfill. It has been prepared in accordance with Utah Administrative Code R315-301 through 320 of the Utah Solid Waste Permitting and Management Rules.

Please feel free to contact me at (435) 716-9752 if you have any questions or concerns.

Issa Hamud
Director

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1 General Content of a Permit Application for Facility Seeking Expansion (R315-310-3)

1.1 General Description of the Site (R315-310-3(1)(b))

The City of Logan is seeking a permit renewal and expansion for a Class IVb landfill. The Class IVb landfill is located directly north of the existing class I landfill, in the southeast quarter of Section 31, Range 1 East Township 12 North (see Figure 1). The expansion area would be just east of the existing class IVb landfill in Section 32, Range 1 East Township 12 North. Access is south 0.2 miles from Highway 30 at point 1.8 miles west of Highway 89 and 91 in the center of Logan City.

Figure 1. Detailed Plat map of existing and proposed C & D Class IVb landfills.

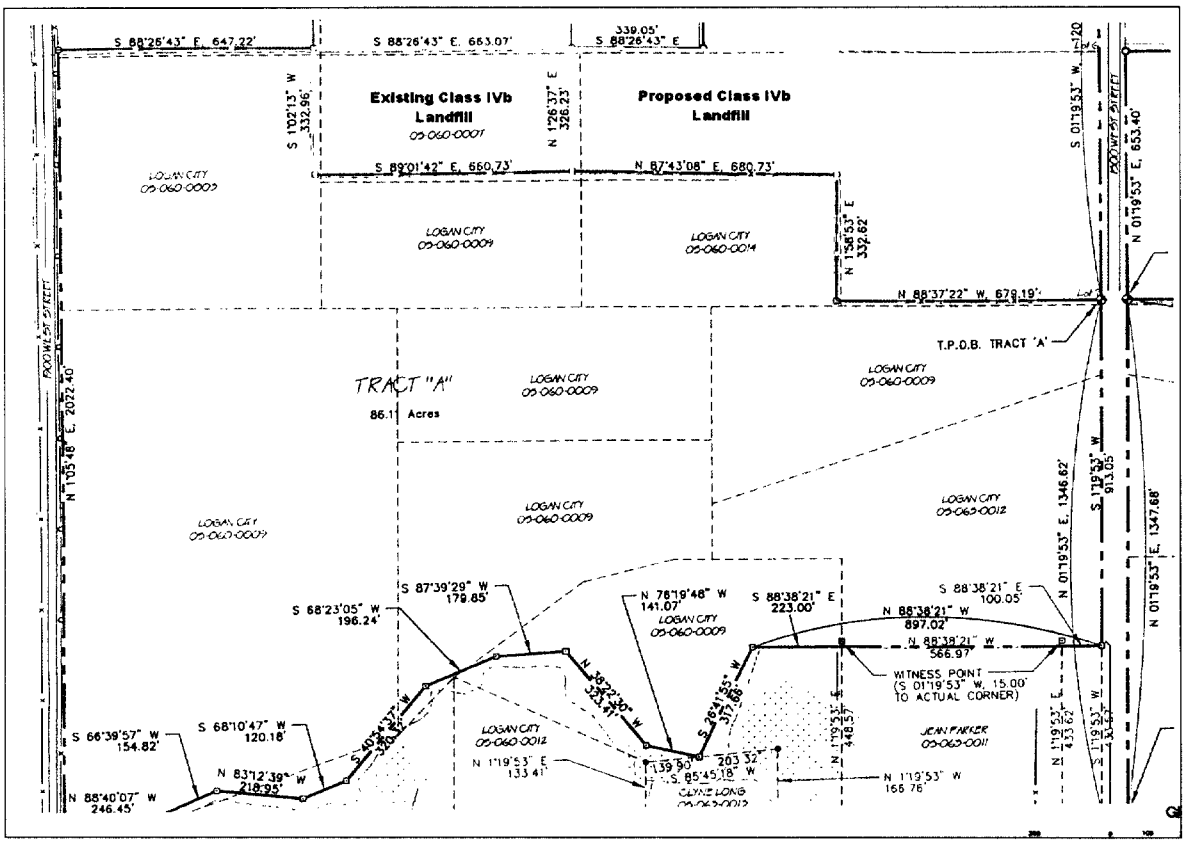


Figure 2. Plat map of existing Class IVb Landfill.

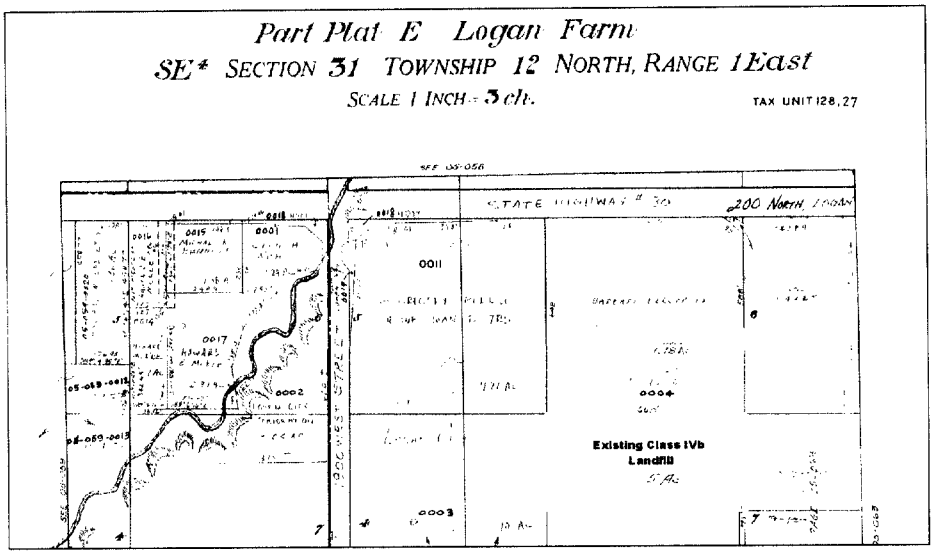
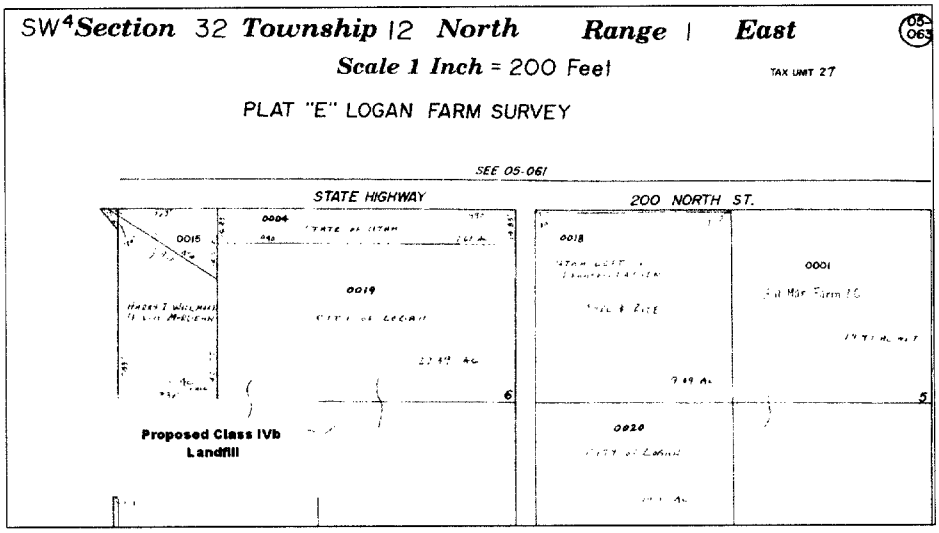


Figure 3. Plat map of proposed Class IVb Landfill.



1.2 Legal Description (R315-310-3(1)(c))

The proposed and existing sites are owned by the City of Logan, a municipality operating under the laws of the State of Utah. The following description identifies the limits of waste deposits at the Logan City Construction and Demolition Debris Landfill for the existing site followed by that of the proposed:

Commencing at the Southwest Corner of Lot 5, Block 27, Plat "E" Logan Farm Survey and running thence S 88° 26'43" E, 647.22 feet along and existing fence line to a fence corner; thence S 1° 26'37" W, 326.23 feet along an existing fence line to a fence corner; thence N 89° 01'42" W, 660.73 feet along an existing fence line to a fence corner; thence N 1° '02'13 E, 332.96 feet along an existing fence line to the True Point of Beginning, containing 5.01 acres.

Commencing at the Northeast Corner of Lot 7, Block 27, Plat "E" Logan Farm Survey and running thence N 1° 26'37" E, 326.23 feet to a fence corner; thence N 87° 43'08" E, 680.73 feet to a fence corner, thence N 1° 58'53" E, 326.23 feet to a fence corner; thence S 88° 26'43" E, 680.73 feet to the True Point of beginning, containing 4.95 acres.

The facility's front gate is located at longitude 111° 52' 06" and latitude 41° 43' 54". Both landfill sites are within the City of Logan zoning boundaries and are designated as public land (PUB, for the existing) and industrial (IND, for the proposed). Both are surrounded by industrial and commercial land. Use of the site for landfilling purposes is consistent with the PUB and IND zoning classification. For a complete zoning boundary map, see Figure A-1 (Appendix A).

1.3 Proof of Ownership (R315-310-3(1)(c))

Proof of ownership for the existing and proposed C&D parcels is located in Appendix A, Figures A-2 and A-3, while Figure A-4 contains a plat map for both parcels.

1.4 Type of Waste to be Handled at the Facility (R315-310-3(1)(d))

The City of Logan served 98,000 persons in approximately 28,000 residential homes and 1,700 commercial businesses in 2003. Last year Logan City Construction and Demolition Landfill recorded approximately 29,716 tons of construction and demolition waste (approximately 99 tons per day). Appendix A, Table A-1 shows the

construction and demolition waste entering the class IVb landfill from 1999 to 2003. Average of these wastes plus 4% growth is what is being used to project the life of the Class IVb landfill (Logan City Sanitary Landfill Waste Projection).

The City of Logan is planning to accept construction and demolition debris in the Class IVb as defined in Rule R315-301-2(10). This includes bricks, concrete, asphalt, rock, roofing shingles (non-asbestos), tree roots, building materials, sheet rock, remodeling or building repair, demolition materials from pavement, houses, commercial buildings, and other structures. Excluded wastes, include, but are not limited to, dead animals, foam insulation, asbestos (tape floor tiles, siding, shingles, etc.), contaminated soil, remediation or cleanup tanks, waste paints solvents, sealers, adhesives, small quantity generator hazardous wastes, containerized liquids, noncontainerized liquids, or sludge containing free liquids (R315-303-3(1)(b)).

The quantity of incoming waste is weighed and recorded in a computerized system by waste code. Daily logs are maintained, monthly reports are completed, and an annual report summarizes the waste characteristics for the year. Class IVb wastes will be coded as either construction debris (CD), asphalt (AS), or concrete (CO).

1.5 Area Served By the Facility (R315-310-3(1)(d))

The Logan City Class IVb landfill will serve the Cache County Service Area. Cache County is composed of 19 cities and towns along with the unincorporated area of the county. All political subdivisions of the State of Utah located in the county are included. There are no Indian reservations within Cache County. The names of the communities may be found below.

Amalga	Nibley	Lewiston	River Heights
Clarkston	North Logan	Logan	Smithfield
Cornish	Paradise	Mendon	Trenton
Hyde Park	Providence	Millville	Wellsville
Hyrum	Richmond	Newton	Unincorporated

The Cache County Service District was established on June 18, 1974, to promote safe and sanitary handling of solid waste materials. At that time, all other existing dump sites within the county were closed and the Cache County Service Area No. 1 was formed. Each participating community signed a contract with the service area to allow solid waste collection and disposal. The Cache County Service District contracted with the City of Logan to provide collection and disposal services for all municipal solid waste generated in the county.

1.6 Plan of Operation (Rule 315-302-2(2))

In compliance with the requirements of Rule 315-302-2(2), General Facility Requirements for Plan of Operation, the landfill will be operated in accordance with the Plan of Operation contained below. The Plan of Operation includes the following elements:

- Intended Schedule of Construction
- On-site Solid Waste Handling Procedures
- Inspection Schedule and Plan
- Contingency Plans: Preventative and Corrective Measures
- Corrective Action Program if Groundwater is contaminated
- Dust Control Plan
- Plan to Control Wind Blown Litter
- Description of Maintenance of Installed Equipment
- Procedures for Handling PCB Wastes
- Disease Vector Control
- Alternative Waste Handling

- Closure Plan
- Post-Closure Plan
- Financial Assurance
- Training and Safety Plan

1.6.1 Intended Schedule of Construction

The schedule of construction will be to divert clean construction waste (specifically concrete, bricks, rocks, dirt, and clean soil) to the cell and fill to a surveyed elevation of 4445 feet (the highest historical groundwater elevation within the cell is 4435.16 feet). This historical high groundwater level was received from Kleinfelder and goes back to June of 2000. It is considered accurate due to the fact that the historical high is 3.4 ft higher than any other recorded measurement and the historical high is only 1.3 ft below ground surface in the measured area. This will require 7 to 10 ft of fill to be deposited in the cell depending on location. The landfill will be broken up into four quarters (northwest, northeast, southwest, and southeast) and thereafter constructed in four phases respectively. The intended schedule is dependent upon the amount of clean fill material that becomes available to the site.

1.6.2 On-Site Waste Handling Procedures

▪ Hours of Operation

The Logan City Landfill is open Monday through Saturday 8:00-6:30 from April 1-September 30 and 8:00-5:30 from October 1-March 31. The landfill will be closed on all major holidays including Civil Rights Day, Presidents Day, Memorial Day, Independence Day, Pioneer Day, Labor Day, Veterans Day, Thanksgiving Day, the day after Thanksgiving, Christmas Day, and New Years Day. Signs will be posted at the entrance for public notification of hours of operation, owner and operator of the site, material accepted and excluded, and fees charged.

- **Site Personnel and Equipment**

The Class IVb landfill will have at least one scale house attendant and one heavy equipment operator on site during all public hours of operation along with one full time sanitary landfill enforcement agent who will conduct daily inspections. Equipment currently used daily at the Logan Construction and Demolition Debris Landfill includes the CAT 826G Compactor and CAT 973 Loader.

1.6.3 Inspection Schedule and Plan

Inspections will be conducted in accordance with Rule R315-302-2(5)(a). A detailed inspection on each incoming construction and demolition debris load will be conducted by the landfill attendant. The load will be visually inspected at the scale to identify unacceptable and excluded wastes. If a landfill attendant identifies a construction and demolition debris load as contaminated with municipal, unacceptable, and/or excluded wastes, the load will be coded as commercial waste (CW), circled, signed by the landfill attendant to indicate identified contamination, and sent to the Class I landfill. Or, in the case of excluded wastes, the load will be rejected and/or the Cache Valley HAZMAT team will be called. Random inspections are also conducted at the tipping face to identify unacceptable, excluded wastes, and liquids as defined by Environmental Protection Agency (EPA) Method 9095, paint filter test. Any loads failing the inspection will be rejected. The Environmental Department plans to conduct 10 additional random inspections at the face on a weekly basis. Appendix D includes waste inspection forms.

With the addition of a Class IVb landfill, the Department of Environmental Health plans to begin a small quantity generator hazardous waste program for Cache County. A county-wide education program has been launched to insure residents and businesses understand the difference between municipal and construction and demolition wastes. Pamphlets which outline acceptable and nonacceptable wastes for Class IVb landfills have been distributed throughout the County, specifically to the known contractors separate containers have been located at the Class IVb landfill

working face so contractors may separate unacceptable wastes and metals during disposal.

If a construction and demolition debris load from a contractor is identified with unacceptable wastes during a scale house or face inspection:

First Offense: The driver will be warned, educated with the Construction and Demolition Debris pamphlet, and urged to pass along the information to the owner/project manager.

Second Offense: The owner will be notified by the Environmental Department and the name of the contractor will be put on the 'Class IVb probation' list.

Third Offense: The contractor will not longer be permitted to dispose of wastes in the Class IVb landfill and forced to pay the municipal waste rate.

If a construction and demolition debris load is identified with excluded wastes during or after a scale house or face inspection:

First Offense: The driver will be warned, educated and the owner/project manager will be notified regarding the identification of excluded wastes.

Second Offense: An investigation will be conducted on the contractor, who will need to show correct disposal of excluded wastes to the Environmental Department hazardous waste inspection.

1.6.4 Contingency Plans

The following contingency plans will be observed for fire and explosion. These guidelines are analogous to the contingency plans for the Class I permit (Montgomery Watson, 1997).

▪ Preventative Measures for Fire and Explosion

The City of Logan will implement the following preventative measures to prevent fire and explosion at the C&D landfill.

1. Implementation of the Waste Placement and Cover Construction Schedule as described later (page 21).

2. Not collecting, accepting or delivering hot materials to the landfill; isolation of fire due to spontaneous combustion inside waste deliver trucks during unloading operations at the landfill.

3. Dust control, equipment maintenance, and equipment cleaning to avoid excessive buildup of oil, dust, and debris that may result in excessive operating temperatures or equipment overload.

4. Providing and maintaining fire extinguishers on landfill equipment and vehicles.

5. Providing a tank/sprayer alternative cover machine that may be substituted as a water sprayer in emergencies.

6. Access to a fire hydrant located on 1400 West at approximately 50 North.

▪ Corrective Measures for Fires

The City of Logan will implement the following corrective measures when fires are identified at the site.

1. Notification. Fires at the landfill will be reported immediately to the City Environmental Director.

2. Combat. The primary means for extinguishing fires will be placing additional cover material to deprive the source of oxygen. Extinguishing burning materials will be given immediate priority at the landfill.

3. Support Equipment and Personnel. When required, support equipment and personnel from other city programs will be diverted to help extinguish the fire. When required, and as appropriate, support also will be given by the Logan City Fire Department. In circumstances where additional support is required, such support will be obtained from other government agencies and through the acquisition of contracted services.

▪ Corrective Measures for Explosions

The City of Logan will implement the following corrective measures when explosions occur at the site.

1. Notification of the fire department
2. Evacuation of personnel from the affected area
3. Rendering assistance to injured personnel
4. Engineering evaluation and implementation of other appropriate corrective actions to vent, reduce, or otherwise control gas generation and/or leakage
5. Relocation of operation to an unaffected area of the landfill.

▪ Corrective Measures for Equipment Breakdown

The City of Logan will implement the following corrective measures for equipment breakdown.

1. Spares of the specific equipment may be located at the Logan Landfill
2. Commercial repair facility will be notified
3. Backup equipment will be provided by the City of Logan Streets and Water Departments, if necessary
4. Auxiliary equipment may be leased from private contractors, borrowed from other County departments, or other nearby landfills, if necessary

1.6.5 Corrective Action Program for Ground Water Contamination

The City of Logan's C&D Landfill status exempts the landfill from this rule according to R315-302-1(2)(e)(vi) and R315-305-4(4).

1.6.6 Dust Control Plan

Access roads within the landfill footprint will be watered at appropriate intervals to prevent dust from escaping the operating area of the landfill.

1.6.7 Plan to Control Wind Blown Litter

The City of Logan's landfill has several established preventative measures to control wind blown litter. Such measures include cover material, litter control fences, and temporary workers. The cover schedule for the Class IVb Landfill is that 6 inches of compacted earthen material be placed at a minimum of once every 30 days (see page 22 of this report). Around the perimeter of the landfill exists a permanent fence that assists in containing windblown litter within the site. Landfill personnel routinely clean up the perimeter of the site to prevent litter spreading outside the boundary. In extreme cases temporary workers are hired to clean the perimeter and the affected areas.

1.6.8 Description of Maintenance of Installed Equipment

The City of Logan's Landfill status exempts the landfill from this rule according to R315-303-3(2)(a) and R315-305-4(4)

1.6.9 Procedures for Handling PCB Wastes

A detailed inspection on each incoming construction and demolition debris load will be conducted by the landfill attendant. The load will be visually inspected at the scale to identify unacceptable and excluded wastes. Random inspections are also conducted at the tipping face to identify unacceptable, excluded wastes, and liquids as defined by Environmental Protection Agency (EPA) Method 9095, paint filter test. Any loads failing the inspection will be rejected. The Environmental Department plans to conduct 10 additional random inspections at the face on a weekly basis. As

stated earlier, See Appendix D, Forms D-1 and D-2 for sample inspection forms. If load inspections reveal the presence of regulated quantities of PCB wastes on incoming haul vehicles, the landfill attendant, the hazardous waste inspector, or the operator will refuse to accept the load and UDEQ will be notified. If regulated quantities of PCB wastes are identified during secondary load checks, random inspections, or at any other time and cannot be traced to the original hauler, the Cache County HAZMAT team will be called and will implement their Hazardous Materials Response Plan. Following notification, it will be the Cache County HAZMAT team's responsibility to ensure the PCB wastes are handled, stored, contained, and/or transported in accordance with applicable federal and state regulations.

1.6.10 Disease Vector Control

In accordance with Rule R315-302-2(2)(k), the City of Logan plans to control disease vectors by maintaining sufficient cover, daily inspections, quarterly inspections and implementing corrective action when needed.

Cover: Prompt application of cover will be the primary means of vector control. Cover will be placed to deny vectors of food sources, burrows, and other habitat. The current plan includes covering the waste once every 30 days. If necessary, the city will cover more frequently than once every 30 days.

Daily Inspections: The Landfill Inspector shall conduct daily inspections for disease vectors, as specified under schedule and plan section of this permit.

Quarterly Inspections: The Landfill Inspector shall conduct quarterly inspections for disease vectors, as specified under schedule and plan section of this permit.

Corrective Action: If disease vectors are detected, the landfill shall notify the Environmental Department Director who shall initiate appropriate procedures. Control of persistent vectors will be coordinated with county and/or state public health officials. When wildlife may be impacted, Utah State Fish and Wildlife agency officials will be contacted prior to any extermination procedures.

1.6.11 Alternative Waste Handling

As required by rule 315-302-2(2)(l) in case of equipment breakdown or adverse conditions such as inclement weather, the construction and demolition waste will be landfilled at the southeast corner of the existing Class I landfill. This area has been designated as a wet weather and alternative disposal area. This area is reserved for disposal of waste when inclement weather or implementation of contingency plans requires discontinuation of operations in the normal operating area of the landfill. The area will be excluded from use for normal disposal operations until the other areas of the landfill have been closed, and will have the following:

- Immediate access from paved access road to the working area.
- All-weather roads from paved access road to the tipping face.
- A 60-day supply of daily cover or alternative daily cover for full-time use as a disposal area.
- A stockpile of cover material reserved for fire suppression in the area that is equal to 30 days supply of normal daily operations cover.
- A 2-foot soil barrier between the alternative area and waste materials in the normal operating area that is constructed to the standards of final cover.

1.6.12 Closure Plan (R315-302-3)

The following closure plan has been prepared for the Logan City Class IVb landfill in accordance with UAC 315-302-3. Closure of the landfill will be performed in accordance with this plan and in such a manner as to:

- minimize the need for further maintenance;
- minimize or eliminate threats to human health and the environment from post-closure escape of solid waste constituents, leachate, landfill gases, contaminated run-off or waste decomposition products to the ground, ground water, surface water, or the atmosphere; and
- adequately prepare the facility for the post-closure period.

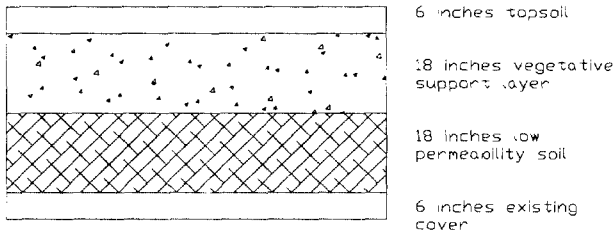
▪ Cell Design

The daily working face cells within the Class IVb landfill will be constructed with an approximate maximum area of 45'(w)X45'(l) in order to minimize the size of the unloading area and also the working face as required by R315-303-3(7)(g). Figure B-1 (Appendix B) presents the final grading plan for both Class IVb landfills as they extend into the existing Class I landfill. Prior to the depositing Class IVb debris, the overlay zones of the Class I landfill will be closed in accordance with the Class I permit.

▪ Closure Construction

The final cover will be constructed in accordance with UAC R315-302-3(4). The final cover will consist of 6 inches of topsoil, 18 inches of a vegetative support layer, 18 inches of a low permeability soil over the 6 inches of existing cover (see Figure 4 on the following page). The final cover will be vegetated with native plants and grasses according to a plan developed or recommended by a representative of the U.S. Department of Agriculture Natural Resource Conservation Service (NRCS) and graded to the appropriate slope, prevent ponding, and minimize infiltration of run-off waters.

Figure 4. Final cover profile.



▪ Site Capacity

The capacity of the Class IVb landfill (existing + proposed) is approximately 1,321,224 cubic yards (cy) of waste disposal lasting until the year 2022 (number calculated by adding the annual C&D waste from 1994 to 2022). Assuming an average in-place density of 1200 lbs/cy from 1994 to 2001 and 1350 lbs/cy from 2002 to 2022, approximately 870,337 tons construction debris will be accepted at the Logan landfill. As stated on page 6 of this report, Table A-1 (Appendix A) shows the landfill life projection.

▪ Final Inspection

In accordance with UAC 315-310-4 (2)(d)(iii), a final report will be prepared, submitted to the Executive Secretary, and entered into the operating record of the facility. Because the closure of the Class IVb landfill will be subsequent with the closure of the Class I landfill, the final report will be included as a subsection to the Class I landfill permit. Thereafter, a final inspection by regulatory agencies will be arranged and after approval by the UDEQ, the post-closure maintenance plan outlined in this permit will be initiated.

▪ Closure Cost Estimate

The closure cost estimate may be found in Tables B-1, B-2, and B-3 (Appendix B) and has been prepared using predicted engineering and construction costs from the approved Class I landfill permit and private contractors within Cache Valley, UT. It is

assumed that some of the costs will be shared between the Class I and Class IVb closures, therefore the costs have been adjusted as additional costs to the existing Class I closure estimate. Three percent inflation was used for future costs as well as a ten percent contingency built into the final estimate to account for unforeseen variances in costs.

In the closure cost estimate no costs are listed regarding the cost of removing any stored items or materials, buildings, equipment, or other items or materials not needed at the closed facility. This is due to the fact that the green waste facility, scale houses (2), maintenance shop, and household hazardous waste facility will remain on-site when the landfill is closed. All of the landfill facilities are outside the landfill boundaries and the city plans to continue waste processing at the current site after the landfill is closed. A transfer station will be built and the aforementioned buildings will be supplemental to the station. The landfill compactors and scraper will be hauled to the new landfill in Clarkston by the City and costs will be minimal. The rest of the existing equipment will remain on-site.

1.6.13 Post-Closure Plan

The post-closure plan shall proceed as outlined in UAC R315-302-3(6) and more specifically, the Class IVb landfill will be monitored as explained below:

> At final closure, the boundary markers used to designate closed areas of the landfill will be used to measure settlement of refuse materials. Additional survey markers will be placed as necessary to monitor areas of suspected movement. Ground elevation will be measured at the base of each boundary marker.

The post-closure cost estimate may be found as Table B-4 (Appendix B). Again, it is assumed that most of the monitoring costs will be shared between the Class I and Class IVb closures, therefore the costs have been adjusted as additional costs to the existing Class I post-closure estimate. A ten percent contingency built into the final estimate to account for unforeseen variances in costs.

1.6.14 Financial Assurance Plan

The City of Logan has already applied and been approved with the Local Government Financial Test as the financial mechanism to cover the costs of closure and post-closure care of the Class I landfill. The City of Logan will continue to use the financial assurance mechanism for the Class IVb landfill.

1.6.15 Training and Safety Plan

All facility personnel involved in management, inspections, and waste disposal operations will be trained in the identification of containers and labels used for hazardous wastes. Hazardous waste screening classes will be offered periodically to all personnel and documentation of training will be included with the operation records for the facility. Records will be maintained and will be held in the record keeping files.

1.7 Form for Recording Weights and Volumes of Waste Received (R315-310-3(1)(f))

This form is included with the inspection forms that will be described later (see Appendix D, Figures D-3 & D-4).

1.8 Inspection Schedule and Inspection Log (R315-310-3(1)(g))

These forms are included with the inspection forms that will be described later (see Appendix D, Figures D-1 thru D-4).

1.9 Recycling Program for Construction and Demolition Waste

To date there is no established recycling program for the Class IVb landfill working face. Current procedures include taking appropriate measures when large amounts of recyclable materials are deposited in the Class IVb landfill.

Chapter

2 Contents of a Permit Application for a New or Expanded Class IV Landfill Facility (R315-310-4)

2.1 U.S.G.S. 7-1/2 Minute Series Map

In Appendix C of this report, Figure C-1, is a U.S.G.S. 7 ½ series map of the Logan and Wellsville quadrangle. The Class I Landfill, existing Class IVb Landfill, and the proposed Class IVb Landfill are all delineated in Figure C-1.

2.2 Topographic Map

In Appendix C of this report, Figure C-2, is a topographic map of the Class I and IVb Landfills showing the existing elevations at the site.

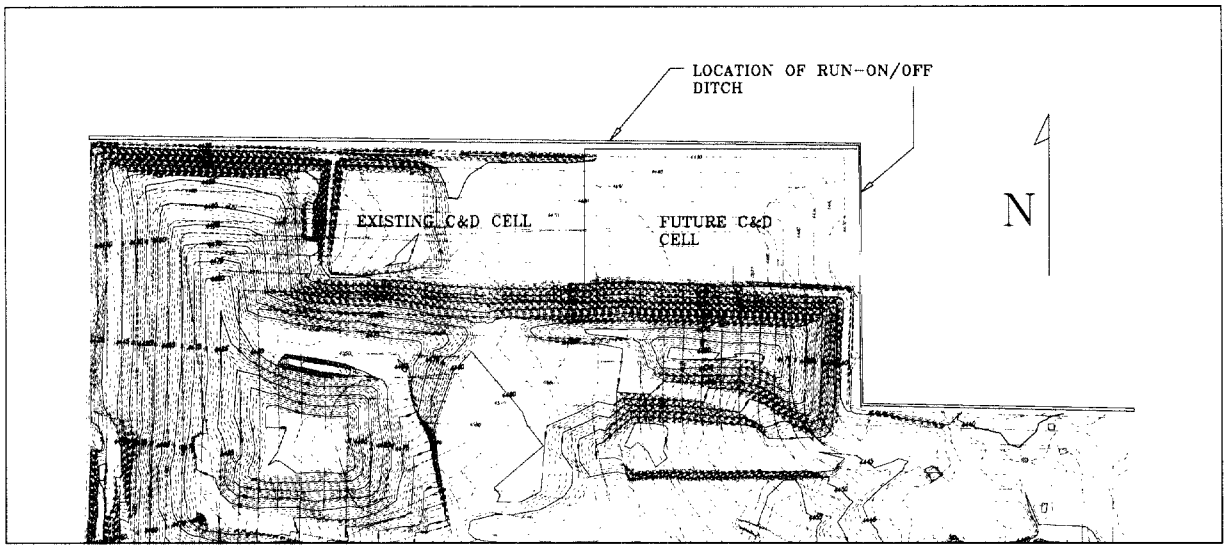
Chapter

3 Contents of a Permit Application for Expanded Class IV Landfill Facility (R315-310-5)

3.1 Design and Location of Run-Off and Run-On Control System (R315-310-5(2)(b))

The design for the landfill will incorporate a run-off control system that will divert the surface flows resulting from a 24-hour, 25-year storm (2.48 inches/hour intensity, - Utah State University Climatology Center) that falls on the landfill cover. The proposed final cover surface was divided into five sub-areas for peak flow calculations (see Appendix F). Three of the five sub-areas are on the north side of the Class I landfill involve the Class IVb landfill; specifically areas 2, 3, and a portion of 1.

Figure 5. Location of Run-on/off Ditch.



Collection ditches located along the proposed road(s) will collect surface runoff and transport it via the road/drop structures to the perimeter of the landfill where it will

travel westward via the run-on diversion channels. The road(s) and accompanying channels will also serve to reduce the volume of sheet flow and erosion on the surface cover. Runoff generated below the roads will be collected in the run-on diversion channels. Preliminary calculations of the flow rates from the predicted runoff used for initial design of the storm water collection ditches are provided in Appendix F.

During construction, the landfill will implement control measures which keep storm water from the working face within the landfill. Operations at the working face will be graded such that run-off will be retained within the landfill. The landfill will maintain a minimum of one foot cover soil (intermediate layer) on the perimeter of all existing slopes and areas not receiving refuse. The intermediate cover thickness will be repaired after every major storm event.

3.2 Standards for Performance (R315-303-2)

▪ Groundwater

The City of Logan's C&D Landfill status exempts the landfill from this rule.

▪ Surface Water

Logan City will follow a surface water management plan to minimize run-off water that has been in contact with the C&D waste. The city will apply an intermediate cover over the inactive C&D landfill areas and will operate the facility working face such that any storm water that comes in contact with the waste will be retained within the landfill area and allowed to evaporate. Furthermore, the owner or operator of the facility will not cause a violation of any Utah Pollution Discharge Elimination System permit or standard from discharges of surface run-off, leachate or any liquid associated with the facility. Also, the owner or operator of the facility will remain in compliance under the Clean Water Act for any discharge as well as in compliance with any area-wide or state-wide plan under Section 208 or 319 of the Clean Water Act.

3.3 Location Standards (315-305-4(1))

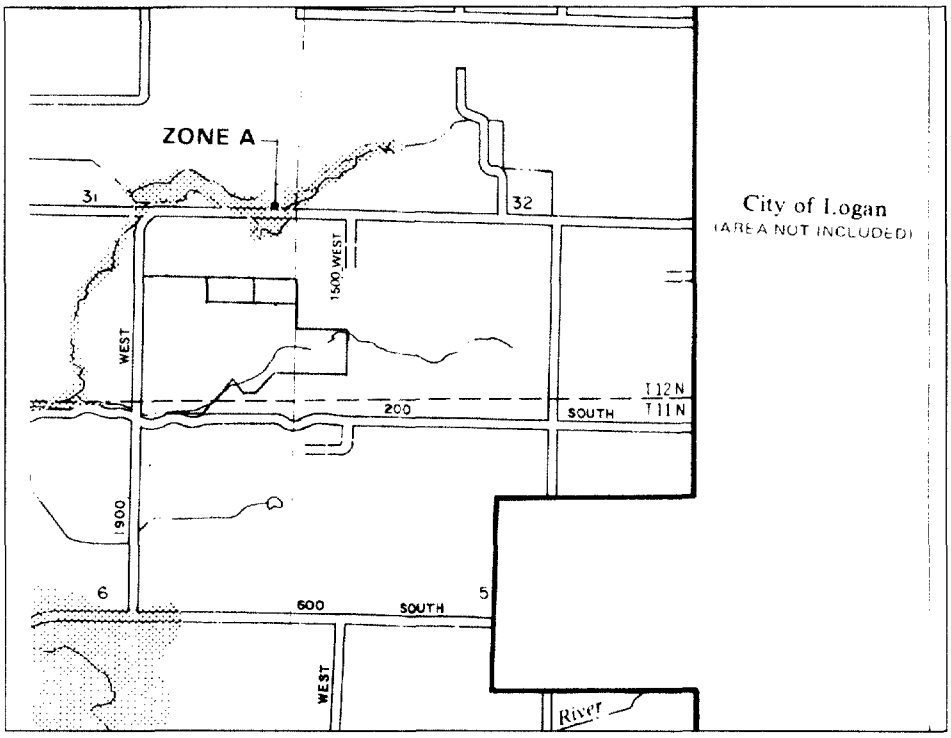
▪ Surface Water (R315-302-1(2)(c))

The existing facility and proposed expansion will not be located on any public land that is being used by a public water system for water shed control for municipal drinking water purposes, or in a location that could cause contamination to a lake, reservoir, or pond.

▪ Floodplains

The existing and proposed Class IVb landfills are not located in nor do they restrict the flow of the 100-year flood as can be see in the figure below. In Figure 3 the gray areas indicate the location of the 100 year flood with the C&D parcels located in the northeast section above the Class I landfill.

Figure 6. Floodplain map with the Class I and IVb landfills highlighted.



▪ Wetlands

The City of Logan's proposed C&D cell is not located in a wetland area nor is the landfill currently encroaching on wetlands. The landfill owner is sensitive to wetland issues and has established a bio-treatment basin consisting of man-made wetlands to treat leachate.

▪ Groundwater

The City of Logan's Landfill status exempts the landfill from this rule.

▪ Geology (R315-302-1(2)(b))

The State of Utah Regulations indicate "No new facility or lateral expansion of an existing facility shall be located in a subsidence area, a dam failure flood area, above an underground mine, above a salt dome, above a salt bed, or on or adjacent to geologic features which could compromise the structural integrity of the facility".

The Logan Landfill has been designated as exempt from this regulation due to its status as an existing landfill not seeking lateral expansion. However, since the Class IVb landfill is seeking expansion, the landfill is not known to be located in a subsidence area, a dam failure flood area, above an underground mine, above a salt dome, or above a salt bed as mentioned in the State of Utah Regulations.

▪ Fault Areas

The landfill site is not located over or within 200 feet of any known Holocene fault. The nearest mapped fault is the central segment of the East Cache fault zone, which is located approximately 5 miles east of the site. The central segment is characterized by a single fault trace at the base of the range front of the Bear River range. In addition, the Junction Hills fault is located approximately 4.5 miles west of the site. The Junction Hills fault is one of three splays of the West Cache fault zone.

▪ Seismic Impact Zones

The EPA and the UDEQ define a seismic impact zone as any location where the expected peak bedrock acceleration from earthquake activity exceeds 0.10 times the

acceleration due to gravity (g). The predicted Maximum Horizontal Acceleration (MHA) at the site is approximately 0.5g, which places the site within a Seismic Impact Zone.

The MHA in lithified earth material is defined in 40 CFR part 258.14 (EPA, 1991) as the "maximum expected horizontal acceleration depicted on a seismic hazard map with a 90% or greater probability that the acceleration will not be exceeded in 250 years, or the maximum expected horizontal acceleration based on site specific seismic risk assessment." This definition was adopted in full by the UDEQ. The acceleration value of approximately 0.5g was obtained from the United States Geologic Survey's (USGS) Earthquake Hazards Program – National Seismic Hazard Mapping Project. The value is an estimated ground surface acceleration of a "firm rock" site, which is identified as having a shear-wave velocity of 760 m/sec in the top 30 meters; sites with different soil types may amplify or de-amplify this value.

An analysis was performed by IGES to evaluate static and seismic stability of the final design. Input information for the stability analyses was based on the available information regarding the site and available published information.

In the analysis, strength properties of the native and proposed final cover soils were evaluated. Analysis for previous permits submitted for the Logan Landfill used strength values for the native clay soils of 29 degrees for the angle of internal friction and 130 psf for the cohesion. There was no indication that laboratory testing had been performed to support these values, however, based on published information and experience, these values seemed appropriate and were used in the analysis.

No information on the strength parameters of the cover soils or deeper granular soils was given and no laboratory tests were completed on these materials. Based on our understanding of the soils to be used for the final cover materials, published literature and experience, strength values of 30 degree and zero cohesion were used for the proposed cover materials and 35 degrees and zero cohesion were used for the

deeper granular soils. A summary of the input soil parameters is provided in the following table:

Table 1. Input soil parameters.

Material	Internal Friction Angle (degrees)	Cohesion (psf)	Unit Weight (pcf)
Native Clay Soil (0-35 ft)	29	130	115
Native Granular Soil (> 35 ft)	35	0	120
Proposed Final Cover Soil	30	0	110

The unit weight values were derived from the previous permit studies (with slight modifications) as well as from published information and experience.

The seismic parameter used in our analysis was based on the maximum horizontal acceleration (MHA) of 0.5g, which is an estimated ground surface acceleration of a "firm rock" site, as previously discussed. Because the upper 30 to 50 feet of soils at the site consist of clay, we assumed the sited does not meet the "firm rock" criteria. IGES therefore, performed a simplified site response analysis to adjust the peak acceleration at the ground surface and the top of the landfill. The simplified analysis considers the upper 100 feet (30 meters), which is classified into one of five categories that are then used to estimate the field free acceleration. Based on the conditions in the upper 100 feet, the site classifies as medium stiff and a free field acceleration equal to the peak bedrock acceleration should be used (Idriss, 1990). The free field acceleration should then be used to evaluate the acceleration at the top of the landfill mass according to relationships developed by Singh and Sun, 1995. Using this procedure, an amplified acceleration of 0.62g is possible at the top of the landfill with an average acceleration in the landfill mass of 0.56g.

For our pseudo-static (seismic) analysis this average attenuated peak motion was reduced by 50% as recommended by Hynes and Franklin (1984) in order to

reasonably account for the limited time that the failure surface actually responds to the peak motion. Consequently, a seismic coefficient equal to 0.28g was used in the seismic analysis of the slopes.

Based on the strength parameters discussed and the adjusted seismic coefficient, IGES conducted additional static and seismic stability analysis on worst-case final cover areas. In general, future final cover slopes are proposed to be constructed at a maximum of 4H:1V (horizontal to vertical).

The existing approved final cover is a total of 48-inches in thickness and consists of the following layers from top to bottom: 6-inch topsoil layer, 18-inch vegetative layer, 18-inch low permeability layer, and a minimum 6-inch daily cover layer. Based on our analysis the landfill slopes were evaluated to be globally stable under both static and seismic conditions. The industry-standard minimum required factors of safety of 1.5 for static and 1.0 for seismic conditions were met with 2.7 for static and 1.2 for seismic.

Hynes and Franklin (1984) concluded that slopes and embankments with yield acceleration equal to half the peak ground acceleration would experience permanent seismic deformations of less than 0.3 meters (1 foot) where amplification is taken into account. Since one-half of the peak acceleration was used in achieving a factor of safety greater than 1.0 and amplification was considered, the maximum deformation as a result of an earthquake is anticipated to be 1 foot or less. This amount of deformation is considered acceptable.

▪ Unstable Areas

The owner or operator of a landfill must consider several factors when determining whether an area is unstable. In guidance document R315-302, these factors are listed as; 1) soil conditions that may result in significant differential settling, 2) geologic or geomorphic features and 3) human-made features or events, both surface and subsurface.

Based on the site location, local geology, and subsurface conditions, the soft soil conditions appear to be the only factor that may be considered a potential unstable area. The soft, saturated clay soils that extend to depths up to 50 feet beneath the landfill will consolidate as the landfill is filled. Based on the magnitude and extent of the proposed landfill mass at completion, 5 to 10 feet of overall settlement could occur at the center of the landfill. This could impact the performance of various design elements of the landfill.

Based on available data, the soils are relatively consistent across the site, and consolidation settlement will likely occur relatively uniform avoiding large differential settlements over short distances. Also, since the landfill is filled slowly, a large portion of the settlement will have occurred at the time of closure and final cover placement. Never-the-less, the proposed final cover is planned to be constructed with no less than 6H:1V slopes, which are capable of sustaining several feet of settlement and still meet drainage requirements. Additionally, there is no bottom liner so any amount of settlement, total or differential, will not affect the performance of the landfill bottom.

3.4 Requirements for Operation (R315-305-5)

▪ Landfill Scavenging

According to R315-305-5(3)(e) scavenging is prohibited on the landfill site at all times.

▪ Waste Placement and Cover Construction Schedule (R315-305-5(4))

The Class IVb Landfill uses the area fill disposal method. Side slopes at the perimeter of the landfill will be maintained at 3:1 or less. Waste will be compacted by a mobile compactor designed specifically for compacting waste materials on a 3:1 slope. Bulky waste materials will be separated prior to compaction, reduced to the minimum practical volume and covered with compactable waste before the soil cover

is placed. Separate piles will be established within the Class IVb landfill for the purpose of concrete and asphalt grinding for recycling.

▪ Cover Material Sources

Cover material, when needed, will be taken from local borrow sources. Geotechnical testing results from 9/14/95 indicated compaction of these soils can achieve vertical permeabilities equal to $1x10^{-7}$ cm/sec (IGES, 2002). A maximum dry density of 96.3 lbs/ft3 with optimum moisture content at 22 percent was achieved using the ASTM D 698 compaction test. Soil compacted to this density yielded a vertical permeability of $9.8x10^{-8}$ cm/sec (IGES, 2002). A minimum of six inches of compacted earthen material will be used to cover the solid waste at a frequency which is sufficient to prevent the uncontrolled spread of fires (minimum of once every 30 days). If necessary, waste will be covered more frequently to control vectors.

▪ Final Cover

Following the placement of the final cell of construction debris and daily cover, the area will be covered by a minimum of twelve inches of intermediate soil. The final cover will consist of the following: a minimum of 6-inches of topsoil, 18-inches of a vegetative support layer, 18-inches of a low permeability soil over the 6-inches of existing cover (see Figure 2 on page 16 of this report). The topsoil will be seeded with grass, shallow-rooted vegetation, or other native vegetation. The final cover will be installed within 30 days after the final elevation is attained in accordance with Rule R315-302-3 (4)(b).

Chapter 4

General Facility Requirements (R315-302-2)

4.1 Record Keeping (R315-302-2(3))

In accordance with rule R315-302-2(3), the City of Logan will maintain and keep all records for at least three years in an approved location. A copy of the face and scale inspection forms, as described earlier, can be found in Appendix D, Forms D-1 and D-2 respectively.

4.1.1 Daily Operating Record

A daily operating record is completed at the end of each day of operation according to R315-302-2(3)(a). This record is completed electronically and then printed out for filing purposes (see Appendix D, Forms D-3 and D-4 for sample record). Any deviations from the approved plan of operation are noted in the summary section of the record.

4.2 Reporting (R315-302-2(4))

The Class IVb landfill will submit an annual report containing all required information to the Executive Secretary by March 1st of each year. The Class IVb report will be included as an attachment to the Class I Logan City Sanitary Landfill, Solid Waste Facility Annual Report.

4.3 Inspections (R315-302-2(5))

The City of Logan will inspect the Class IVb landfill quarterly to prevent malfunctions and deterioration, operator errors, and discharges, which may cause or lead to the release of wastes or contaminated materials to the environment or create a threat to human health. These inspections shall cover the following areas:

- Waste placement, compaction, and cover

- Fences
- Roads and access roads
- Run-on/run-off controls
- Final and intermediate cover
- Litter controls
- Records

The City of Logan will keep a record of the inspections and place it in the daily operating record on the day of the inspection. Areas needing correction, as noted on the inspection report, shall be corrected. The corrective actions shall be documented in the daily operating record (see Appendix D, Forms D-3 and D-4).

4.4 Recording with the County Recorder (R315-302-2(6))

Logan City Class IVb landfill will submit a plat and a statement of fact concerning the location of the disposal site to the county recorder to be recorded as part of the record of title. The City of Logan will also submit a proof of record of title filing to the Executive Secretary within 60 days after certification of closure.

REFERENCES

City of Logan Department of Environmental Health. Solid Waste Facility Annual Report 1998. December 31, 1998.

Hynes, M.E. and A.G. Franklin, 1984, Rationalizing the Seismic Coefficient Method, Department of the Army, Miscellaneous Paper GL-84-13.

Idriss, I.M., 1990, Response of Soft Soil Sites During Earthquakes, Procedures Symposium to Honor Professor H.B. Seed Berkeley, California.

IGES. Logan City Sanitary Landfill Class I Permit Renewal (Revised). March 2002.

Kavazanjian, E., et al, 1995, Evaluation of MSW properties for Seismic Analysis, Proceedings of the Geoenvironment 2000 Specialty Conference, ASCE, Vol. 2, pp. 1126-1141, New Orleans, Louisiana, 24-26 February.

Montgomery Watson. Logan City Sanitary Landfill Class I Permit Application (Revised). January 1997.

Singh, S., and J.I. Sun, 1995, Seismic evaluation of Municipal Solid Waste Landfills, Proceedings of the Geoenvironment 2000 Specialty Conference, ASCE Vol. 2, pp. 1081-1096, New Orleans Louisiana, 24-26 February.

Unites States, Environmental Protection Agency, 1995. RCRA Subtitle D (258), Seismic Design Guidance for Municipal Solid Waste Landfill Facilities, Richardson and Kavazanjian, EPA/600/R-95-051, April 1995.

Utah Department of Environmental Quality. Utah Administrative Code: Solid Waste Permitting and Management Rules R315-301 through 320. J

APPENDIX A

Facility Information

City of Logan
Zoning Map

Apr. 2004

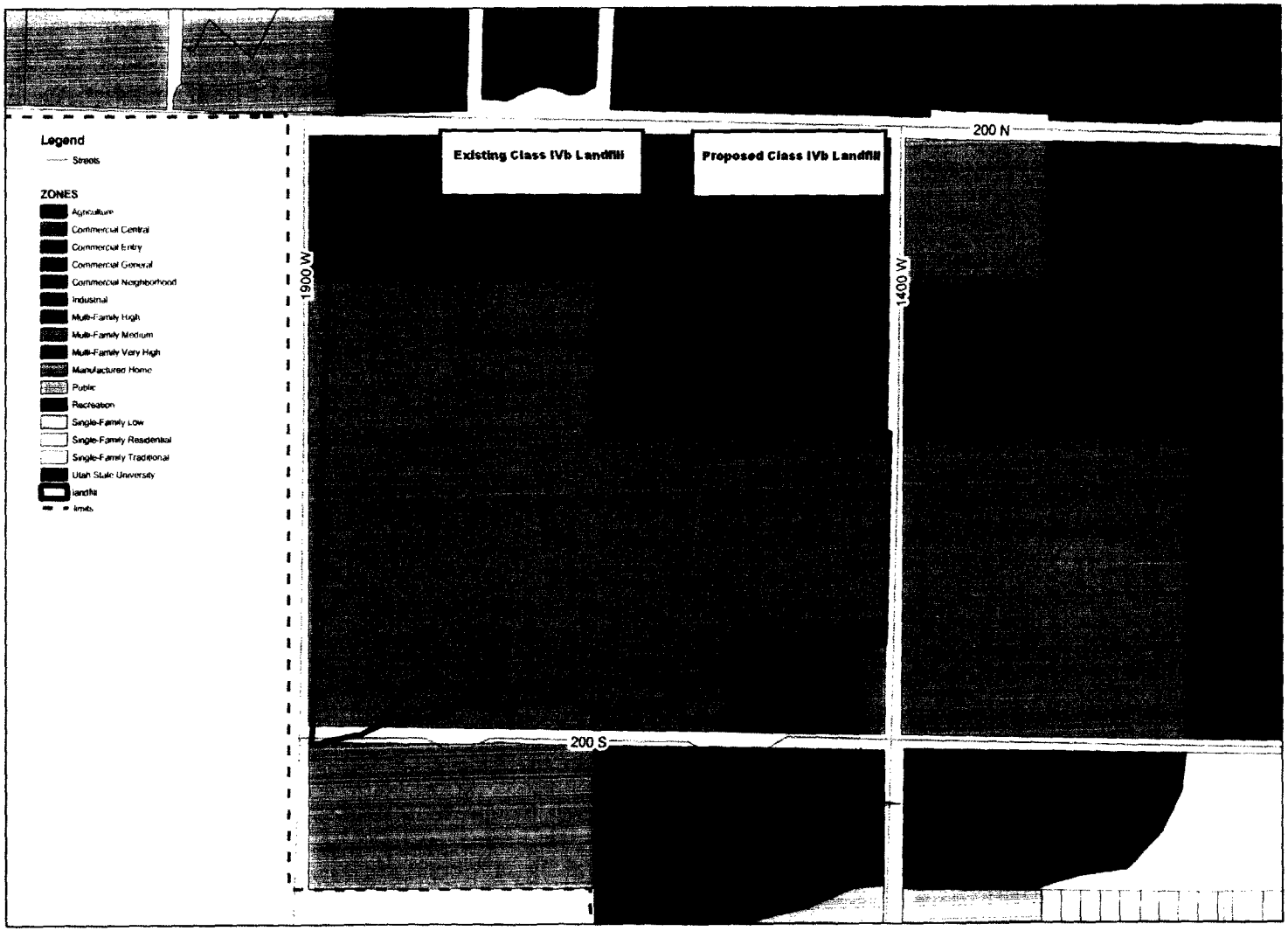


Figure A-1. Land Use Zoning Map for Logan City Class I and Class IVb Landfills

WHEN RECORDED, MAIL TO:

City of Logan
P.O. Box 527
Logan, UT 84321
ATT: Ray Hugie

Space above for Recorder's Use

Warranty Deed

JOSEPH DEWAIN BERGER and BARBARA F. BERGER, husband and wife , grantor,

of North Logan , County of Cache , State of Utah,

hereby CONVEY and WARRANT to

CITY OF LOGAN, a municipal corporation,

, grantee,

of Logan , County of Cache , State of Utah,

for the sum of Ten and no/100...and other valuable consideration..... DOLLARS,

the following described tract of land in Cache County, State of Utah, to-wit:

The North Half of the East Half of Lot 4, Block 27, Plat "E" Logan Farm Survey; located in the Southeast quarter, Section 31, Township 12 North, Range 1 East, Salt Lake Base and Meridian.

ENT 521427 BK 447 PG 553
DATE 6-APR-1989 2:10PM FEE 0.00
MICHAEL L GLEED, RECORDER
** CACHE COUNTY, UTAH ** RECORDED BY MG
FOR CITY OF LOGAN

WITNESS the hand of said grantor, this 31st day of March ,19 89 .

Signed in the presence of

Joseph Dewain Berger

Barbara F. Berger

STATE OF UTAH }
COUNTY OF Cache } ss.

On the 31st day of March ,19 89 , personally appeared before me Joseph Dewain Berger and Barbara F. Berger , the signer s of the above instrument, who duly acknowledged to me that they executed the same.

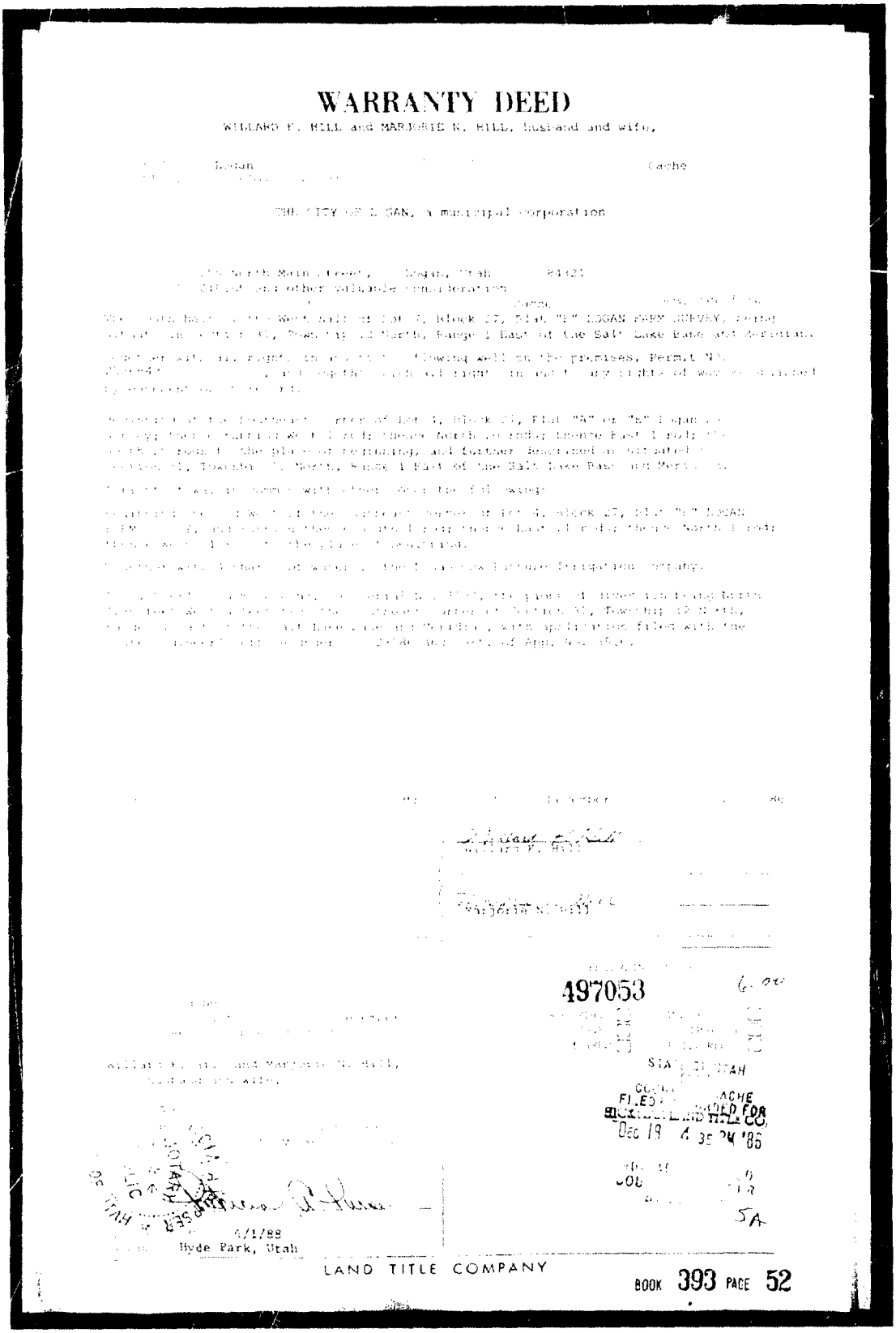
Notary Public

My Commission Expires: 3/15/90 Residing at: Logan, UT

FORM 161.1 — WARRANTY DEED — Kelly Co., 88 W. Ninth South, S.L.C., Utah

BOOK 447 PAGE 553

Figure A-2. Warranty Deed for existing Class IVb landfill.



WARRANTY DEED

WILLARD F. HILL and MARJORIE N. HILL, husband and wife,

Logan Cache

TO: CITY OF LOGAN, a municipal corporation

497053

STATE OF UTAH

COUNTY OF CACHE

FILED AND RECORDED FOR HILL & CO.

Dec 19 A 35 24 '85

4/1/88

Hyde Park, Utah

LAND TITLE COMPANY

BOOK 393 PAGE 52

Figure A-3. Warranty Deed for proposed Class IVb landfill.

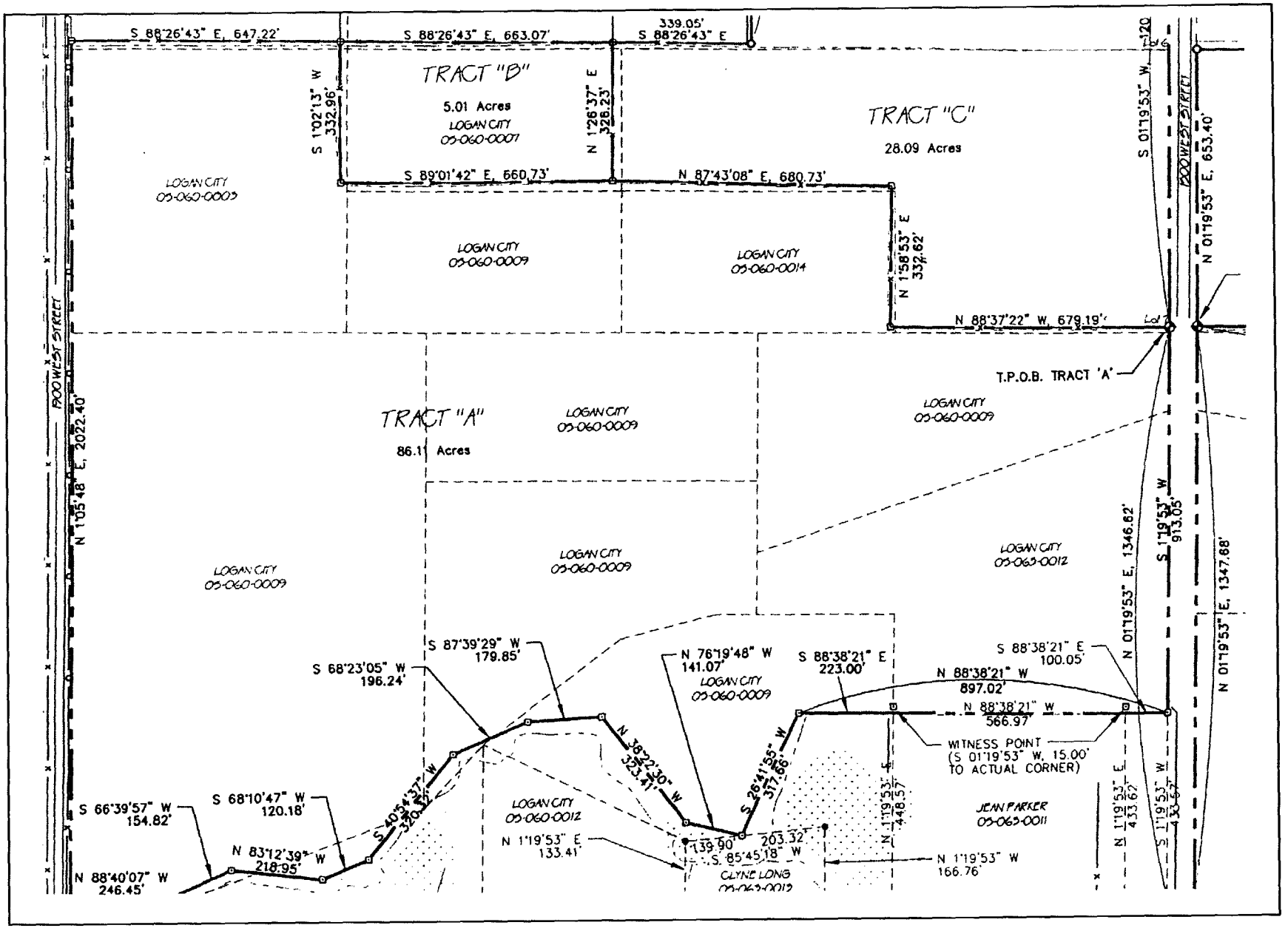


Figure A-4. Plat map for existing and proposed C&D parcels (Tract B and a portion of Tract C).

Table A-1. Logan City landfill life projection.

LOGAN LANDFILL LIFE PROJECTION

YEAR	PROJECTED ANNUAL MSW WASTE USE (TONS)	PROJECTED ANNUAL C&D WASTE USE (TONS)	PROJECTED TOTAL USE (TONS)	COMPACTION (LBS/CY)	PROJECTED ANNUAL WASTE USE (CY)	TOTAL REFUSE VOLUME (CY)	PROJECTED ANNUAL SOIL USE (CY)	TOTAL SOIL USE (CY)	TOTAL VOL USED (CY)	REMAINING LANDFILL CAPACITY (CY)
1960	3,746	0	3,746	1,200	6,243	6,243	2,060	2,060	8,303	10,714,066
1961	3,818	0	3,818	1,200	6,363	12,607	2,100	4,160	16,767	10,705,603
1962	4,379	0	4,379	1,200	7,132	19,738	2,353	6,514	26,252	10,696,118
1963	4,755	0	4,755	1,200	7,925	27,663	2,615	9,129	36,792	10,685,577
1964	5,245	0	5,245	1,200	8,742	36,405	2,885	12,014	48,419	10,673,951
1965	5,749	0	5,749	1,200	9,582	45,987	3,162	15,176	61,163	10,661,207
1966	6,477	0	6,477	1,200	10,795	56,782	3,562	18,738	75,520	10,646,850
1967	7,226	0	7,226	1,200	12,043	68,825	3,974	22,712	91,537	10,630,832
1968	7,997	0	7,997	1,200	13,328	82,153	4,398	27,111	109,264	10,613,106
1969	8,789	0	8,789	1,200	14,648	96,802	4,834	31,945	128,746	10,593,623
1970	9,603	0	9,603	1,200	16,005	112,807	5,282	37,226	150,033	10,572,337
1971	10,481	0	10,481	1,200	17,468	130,275	5,765	42,991	173,266	10,549,104
1972	11,385	0	11,385	1,200	18,975	149,250	6,262	49,253	198,503	10,523,867
1973	12,317	0	12,317	1,200	20,528	169,778	6,774	56,027	225,805	10,496,564
1974	13,275	0	13,275	1,200	22,125	191,903	7,301	63,328	255,231	10,467,138
1975	29,702	0	29,702	1,200	49,503	241,407	16,336	79,664	321,071	10,401,299
1976	31,868	0	31,868	1,200	53,113	294,520	17,527	97,192	391,712	10,330,658
1977	34,091	0	34,091	1,200	56,818	351,338	18,750	115,942	467,280	10,255,090
1978	36,373	0	36,373	1,200	60,622	411,960	20,005	135,947	547,907	10,174,463
1979	38,714	0	38,714	1,200	64,523	476,483	21,293	157,240	633,723	10,088,617
1980	41,113	0	41,113	1,200	68,522	545,005	22,612	179,852	724,857	9,997,513
1981	43,795	0	43,795	1,200	72,992	617,997	24,087	203,939	821,936	9,900,434
1982	46,553	0	46,553	1,200	77,588	695,585	25,604	229,543	925,128	9,797,242
1983	49,388	0	49,388	1,200	82,313	777,898	27,163	256,706	1,034,605	9,687,765
1984	52,299	0	52,299	1,200	87,165	865,063	28,764	285,471	1,150,534	9,571,835
1985	55,288	0	55,288	1,200	92,147	957,210	30,408	315,879	1,273,089	9,449,280
1986	58,353	0	58,353	1,200	97,255	1,054,465	32,094	347,973	1,402,438	9,319,931
1987	61,494	0	61,494	1,200	102,490	1,156,955	33,822	381,795	1,538,750	9,183,619
1988	64,531	0	64,531	1,200	107,552	1,264,507	35,492	417,287	1,681,794	9,040,576
1989	67,900	0	67,900	1,200	113,167	1,377,673	37,345	454,632	1,832,306	8,890,064
1990	71,378	0	71,378	1,200	118,963	1,496,637	39,258	493,890	1,990,527	8,731,843
1991	74,968	0	74,968	1,200	124,947	1,621,583	41,232	535,123	2,156,706	8,565,664
1992	77,317	0	77,317	1,200	128,862	1,750,445	42,524	577,647	2,328,092	8,394,278
1993	77,825	0	77,825	1,200	129,708	1,880,153	42,804	620,451	2,500,604	8,221,765
1994	61,781	15,803	76,584	1,200	127,640	2,007,793	42,121	662,572	2,670,365	8,052,004
1995	67,315	17,502	84,817	1,200	141,362	2,149,155	46,649	709,221	2,858,376	7,863,994
1996	70,063	18,216	88,277	1,200	147,128	2,296,283	48,552	757,773	3,054,056	7,668,313
1997	75,232	19,560	94,792	1,200	157,987	2,454,270	52,136	809,909	3,264,179	7,458,190
1998	79,143	20,577	99,720	1,200	166,200	2,620,471	54,846	864,755	3,485,226	7,237,144
1999	81,383	12,853	94,236	1,200	157,060	2,777,531	51,830	916,585	3,694,116	7,028,254
2000	80,156	44,758	124,914	1,200	208,190	2,985,721	68,703	985,288	3,971,008	6,751,361
2001	86,013	22,645	108,658	1,200	181,097	3,166,817	56,219	1,021,507	4,188,321	6,534,045
2002	84,194	13,544	97,738	1,350	144,797	3,311,614	28,959	1,050,467	4,362,081	6,360,789
2003	87,562	29,716	117,278	1,350	173,745	3,485,359	34,749	1,085,215	4,570,575	6,151,795
2004	91,064	23,677	114,741	1,350	169,987	3,655,346	33,997	1,119,213	4,774,558	5,947,811
2005	94,707	24,624	119,331	1,350	176,786	3,832,132	35,357	1,154,570	4,986,702	5,735,668
2006	98,495	25,609	124,104	1,350	183,857	4,015,989	36,771	1,191,341	5,207,331	5,515,039
2007	102,435	26,633	129,068	1,350	191,212	4,207,201	38,242	1,229,584	5,436,785	5,285,585
2008	106,532	27,698	134,231	1,350	198,860	4,406,061	39,772	1,269,356	5,675,417	5,046,953
2009	110,794	28,806	139,600	1,350	206,815	4,612,876	41,363	1,310,719	5,923,595	4,798,775
2010	115,226	29,959	145,184	1,350	215,087	4,827,963	43,017	1,353,736	6,181,699	4,540,670
2011	119,834	31,157	150,991	1,350	223,691	5,051,654	44,738	1,398,474	6,450,128	4,272,241
2012	124,628	32,403	157,031	1,350	232,638	5,284,292	46,528	1,445,002	6,729,294	3,993,075
2013	129,613	33,699	163,313	1,350	241,944	5,526,236	48,389	1,493,391	7,019,627	3,702,743
2014	134,798	35,047	169,845	1,350	251,622	5,777,858	50,324	1,543,715	7,321,573	3,400,797
2015	140,189	36,449	176,638	1,350	261,687	6,039,544	52,337	1,596,052	7,635,597	3,086,773
2016	145,797	37,907	183,704	1,350	272,154	6,311,698	54,431	1,650,483	7,962,181	2,760,188
2017	151,629	39,423	191,052	1,350	283,040	6,594,738	56,608	1,707,091	8,301,829	2,420,540
2018	157,694	41,000	198,694	1,350	294,362	6,889,100	58,872	1,765,964	8,655,064	2,067,306
2019	164,002	42,640	206,642	1,350	306,136	7,195,236	61,227	1,827,191	9,022,427	1,699,943
2020	170,562	44,346	214,908	1,350	318,382	7,513,618	63,676	1,890,867	9,404,485	1,317,885
2021	177,384	46,120	223,504	1,350	331,117	7,844,735	66,223	1,957,091	9,801,825	920,544
2022	184,479	47,965	232,443	1,350	344,362	8,189,096	68,872	2,025,963	10,215,059	507,311
2023	191,859	49,883	241,742	1,350	358,136	8,547,232	71,627	2,097,590	10,644,822	77,547
2024	199,533	51,879	251,412	1,350	372,462	8,919,694	74,492	2,172,082	11,091,776	-369,407
2025	207,514	53,954	261,468	1,350	387,360	9,307,054	77,472	2,249,554	11,556,608	-834,239
2026	215,815	56,112	271,927	1,350	402,854	9,709,908	80,571	2,330,125	12,040,033	-1,317,664
2027	224,447	58,356	282,804	1,350	418,969	10,128,877	83,794	2,413,919	12,542,796	-1,820,426
2028	233,425	60,691	294,116	1,350	435,727	10,564,604	87,145	2,501,064	13,065,668	-2,343,299
2029	242,762	63,118	305,881	1,350	453,156	11,017,760	90,631	2,591,696	13,609,456	-2,887,086
2030	252,473	65,643	318,116	1,350	471,283	11,489,043	94,257	2,685,952	14,174,995	-3,452,625

6,187,620   1,32[illegible],973   7,517,593

C&D Volume 2011-2023   3,390,038

Air space required for MSW in 2023

ASSUMPTIONS

1) Numbers in bold are actual tonnages
2) Initial densities are approximately 1200 lbs/cy
3) Soil as cover use is approximately 2:1 (MSW:Soil) = 33%
4) Waste stream is assumed to increase at 4% per year from 200[illegible]
5) [illegible] will go to 20% after 2007
6) [illegible] of Landfill avg depth of MSW below existing ground [illegible]
7) Actual air space consumed as of the end of 2001 is 4,194,000 cubic yards according to survey data and using assumption on density and soil use parameters were adjusted to calibrate the air space consumed in the boxed cell above = 4,1[illegible]
8) C&D volume are approximately 20.6% of total waste stream
9) MSW densities will increase to 1350 lbs per cubic yard
10) [illegible] does not include final cover soils
11) Airspace increase due to Diversion of all C&D out of MSW landfill =

APPENDIX B

Final Grading, Closure Costs, and Post-Closure Costs

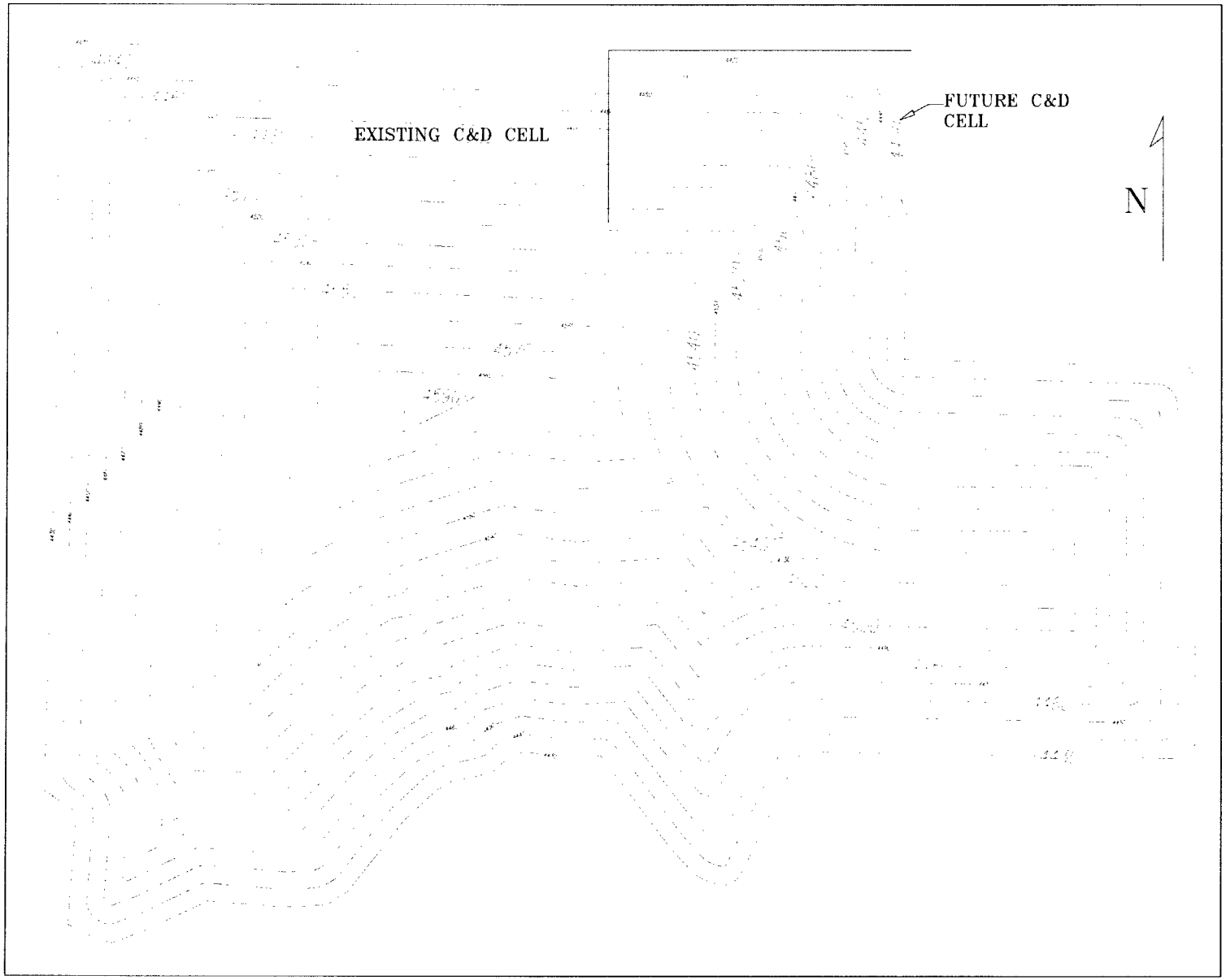


Figure B-1. Final grading plan for the Class I and IVb landfills.

CLOSURE COSTS (IMMEDIATE CLOSURE)

Section 1.0 - Engineering — CLOSURE NOW

Item	Description	Unit Measure	Cost/Unit	No. Units	Total Cost
1.1	Topographic Survey	[illegible]	[illegible]		[illegible]
1.2	Boundary Survey for Closure	[illegible]			[illegible]
1.3	Site Evaluation	[illegible]	[illegible]		[illegible]
1.4	Development of Plans	[illegible]	[illegible]		[illegible]
1.5	Contract Administration - (Bidding and Award)	[illegible]	$7,500		[illegible]
1.6	Certification of Final Cover and Closure Notice	[illegible]	[illegible]	[illegible]	[illegible]
1.7	Project Management - Construction Oversight and Testing	[illegible]	[illegible]		[illegible]
1.8	Monitor Well Consultant Cost	[illegible]			[illegible]
1.9	Other Environmental Permit C[illegible]	[illegible]			[illegible]
			Engineering Subtotal		[illegible]

Section 2.0 - Construction — CLOSURE NOW

Item	Description	Unit Measure	Cost/Unit	No. Units	Total Cost
2.1	Final Cover System				
2.1.1	*Site Preparation - Site Regrading*	ACRE	[illegible]	[illegible]	[illegible]
2.1.2	*[illegible]*	[illegible]			[illegible]
2.1.3	*[illegible] (If Applicable)*				
a	[illegible]	[illegible]			[illegible]
b	Soil Procurement [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
c	Soil Transportation	[illegible]	[illegible]	[illegible]	[illegible]
d	Soil Placement	[illegible]	[illegible]	[illegible]	[illegible]
e	Soil Amendment [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.1.4	*Low permeability Layer (Synthetic - If Applicable)*				
a	[illegible]	NA			[illegible]
b	[illegible]	NA			[illegible]
c	[illegible]	[illegible]			[illegible]
2.1.5	*Drainage Layer (Soil - If Applicable)*				
a	[illegible]	[illegible]			[illegible]
b	[illegible]	[illegible]			[illegible]
2.1.6	*Drainage Layer (Synthetic - If Applicable)*				
a	[illegible]	[illegible]			[illegible]
b	[illegible]	[illegible]			[illegible]
2.1.7	*Erosion Protection Soil Layer*				
a	Soil Purchase	[illegible]			[illegible]
b	Soil Procurement [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
c	Soil Transportation	[illegible]	[illegible]	[illegible]	[illegible]
d	Soil Placement	[illegible]	[illegible]	[illegible]	[illegible]
e	Soil Amendment [illegible]	[illegible]			[illegible]
2.1.8	*Topsoil Layer*				
a	Soil Purchase	[illegible]			[illegible]
b	Soil Procurement [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
c	Soil Transportation	[illegible]	[illegible]	[illegible]	[illegible]
d	Soil Placement	[illegible]	[illegible]	[illegible]	[illegible]
e	Soil Amendment [illegible]	[illegible]			[illegible]
2.1.9	*Revegetation*				
a	Seeding	ACRE	[illegible]	[illegible]	[illegible]
b	Fertilizing	ACRE	[illegible]	[illegible]	[illegible]
c	Mulch	ACRE	[illegible]	[illegible]	[illegible]
d	[illegible]	ACRE	[illegible]	[illegible]	[illegible]
2.2	Stormwater Protection Structures				
a	Culvert	[illegible]	[illegible]		[illegible]
b	[illegible]	[illegible]	[illegible]		[illegible]
c	Ditches/Berms	[illegible]	[illegible]		[illegible]
d	Detention Basins	[illegible]			[illegible]
2.3	Gas Collection System				
a	Design	[illegible]			[illegible]
b	Additional Equipment Installation	[illegible]			[illegible]
2.4	Leachate Collection System				
a	Design	NA			[illegible]
b	Additional Equipment Installation	NA			[illegible]
2.5	Groundwater Monitoring System				
a	[illegible] Installation	[illegible]			[illegible]
b	[illegible]	[illegible]			[illegible]
2.6	Site Security				
a	[illegible]	NA			[illegible]
b	[illegible]	NA			[illegible]
2.7	Miscellaneous				
a	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
b	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Construction Subtotal		[illegible]

[illegible]

Total	[illegible]
[illegible]% Contingency	[illegible]
Subtotal Closure Cost	[illegible]

Table B-1. Estimated immediate closure costs.

CLOSURE COSTS (PHASE I & PHASE II)

Section 1.0 - Engineering

Item	Description	PHASE I Unit Measure	PHASE I Cost/Unit	PHASE I No. Units	PHASE I Total Cost	PHASE II Unit Measure	PHASE II Cost/Unit	PHASE II No. Units	PHASE II Total Cost
1.1	Topographic Survey	LS	[illegible]	1	[illegible]	LS	[illegible]	1	[illegible]
1.2	Boundary Survey for Closure	NA				NA			
1.3	Site Evaluation	LS	[illegible]	1	[illegible]	LS	[illegible]	1	[illegible]
1.4	Development of Plans	LS	[illegible]	1	[illegible]	LS	[illegible]	1	[illegible]
1.5	Contract Administration (Bidding and Award)	LS	$7,500	1	[illegible]	LS	$7,500	1	[illegible]
1.6	Administrative Costs (Certification of Final Cover and Closure Notice)	LS	$7,500	1	[illegible]	LS	[illegible]	1	[illegible]
1.7	Project Management (Construction Observation and Testing)	LS	[illegible]	1	[illegible]	LS	[illegible]	1	[illegible]
1.8	Monitor Well Consultant Cost	NA			$0	NA			$0
1.9	Other Environmental Permit Costs	NA			$0	NA			$0
				Engineering Subtotal	[illegible]			Engineering Subtotal	[illegible]

Section 2.0 - Construction

Item	Description	PHASE I Unit Measure	PHASE I Cost/Unit	PHASE I No. Units	PHASE I Total Cost	PHASE II Unit Measure	PHASE II Cost/Unit	PHASE II No. Units	PHASE II Total Cost
2.1	Final Cover System								
2.1.1	*Site Preparation and Regrading*	ACRE	[illegible]	[illegible]	[illegible]	ACRE	[illegible]	[illegible]	[illegible]
2.1.2	*[illegible]*	NA			$0	NA			$0
2.1.3	*[illegible] (If Applicable)*								
a	Soil On Site	NA			$0	NA			$0
b	Soil [illegible]	CY	[illegible]	43,888	[illegible]	CY	[illegible]	[illegible]	[illegible]
c	Soil Transportation	CY	$1.50	43,888	[illegible]	CY	[illegible]	[illegible]	[illegible]
d	Soil Placement	CY	$1.00	43,888	[illegible]	CY	[illegible]	[illegible]	[illegible]
e	Soil [illegible]	CY	[illegible]	43,888	[illegible]	CY	[illegible]	[illegible]	[illegible]
2.1.4	*Low-permeability Layer (Synthetic - If Applicable)*								
a	[illegible]	NA			$0	NA			$0
b	[illegible]	NA			$0	NA			$0
c	[illegible]	NA			$0	NA			$0
2.1.5	*Drainage Layer (If Applicable)*								
a	Geotextile	NA			$0	NA			$0
b	[illegible]	NA			$0	NA			$0
2.1.6	*Drainage Layer ([illegible] - If Applicable)*								
a	[illegible]	NA			$0	NA			$0
b	[illegible]	NA			$0	NA			$0
2.1.7	*Erosion Protection Soil Layer*								
a	Soil On Site	NA			$0	NA			$0
b	Soil Excavation and Loading	CY	[illegible]	43,888	[illegible]	CY	$0.50	[illegible]	[illegible]
c	Soil Transportation	CY	$1.50	43,888	[illegible]	CY	[illegible]	[illegible]	[illegible]
d	Soil Placement	CY	[illegible]	43,888	[illegible]	CY	[illegible]	[illegible]	[illegible]
e	Soil [illegible]	CY			$0	CY			[illegible]
2.1.8	*Topsoil Layer*								
a	Soil On Site	NA			$0	NA			[illegible]
b	Soil Excavation and Loading	CY	$0.50	14,292	[illegible]	CY	$0.50	24,570	[illegible]
c	Soil Transportation	CY	$1.50	14,292	$21,944	CY	$1.50	24,570	[illegible]
d	Soil Placement	CY	$1.50	14,292	[illegible]	CY	$1.50	24,570	[illegible]
e	Soil [illegible]	NA			$0	NA			[illegible]
	Revegetation								
a	Seeding	ACRE	[illegible]	[illegible]	[illegible]	ACRE	[illegible]	[illegible]	[illegible]
b	[illegible]	ACRE	[illegible]	[illegible]	[illegible]	ACRE	$200	[illegible]	[illegible]
c	[illegible]	ACRE	[illegible]	[illegible]	[illegible]	ACRE	$200	[illegible]	[illegible]
d	[illegible]	ACRE	[illegible]	[illegible]	[illegible]	ACRE	[illegible]	[illegible]	[illegible]
2.2	Stormwater Protection Structures								
a	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	$1,500	1	[illegible]
b	[illegible]	NA	[illegible]	[illegible]	[illegible]	NA	[illegible]	10	[illegible]
c	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
d	[illegible]	[illegible]			[illegible]	NA			
2.3	Gas Collection System								
a	[illegible]	NA				NA			[illegible]
b	Additional [illegible]	NA				NA			[illegible]
2.4	Leachate Collection System								
a	[illegible]	NA			$0	NA			[illegible]
b	Additional [illegible] Installation	NA			[illegible]	NA			[illegible]
2.5	Groundwater Monitoring System								
a	[illegible]	NA			$0	NA			[illegible]
b	[illegible]	NA			[illegible]	NA			[illegible]
2.6	Site Security								
a	[illegible]	NA			$0	NA			[illegible]
b	[illegible]	NA			[illegible]	NA			[illegible]
2.7	Miscellaneous								
a	[illegible]	LS	$12,000	1	[illegible]	LS	[illegible]	1	[illegible]
b	[illegible]	LS	$3,000	1	$3,000	LS	[illegible]	1	[illegible]
				Construction Subtotal	[illegible]			Construction Subtotal	[illegible]

[illegible]

	Phase I		Phase II	
Total		[illegible]		[illegible]
10% Contingency		[illegible]		[illegible]
Subtotal Closure Cost		[illegible]		[illegible]
Inflation Factor	[illegible]		[illegible]	
Inflated Closure Cost (2% inflation)		[illegible]		[illegible]

Table B-2. Closure costs for phases I and II.

CLOSURE COSTS (PHASE III & PHASE IV)

Section 1.0 - Engineering

Item	Description	Unit Measure	PHASE III (ESTIMATED DATE OF CLOSURE: 2022, AREA: 1945,000 FT SQ) Cost/Unit	No. Units	Total Cost	PHASE IV (ESTIMATED DATE OF CLOSURE: 2024, AREA=975,000 FT SQ) Unit Measure	Cost/Unit	No. Units	Total Cost
1.1	Topographic Survey	LS	$5,000	1	$5,000	LS	$5,000	1	$5,000
1.2	Boundary Survey for Closure	NA				LS	$7,500	1	$7,500
1.3	Site Evaluation	LS	$2,500	1	$2,500	LS	$2,500	1	$2,500
1.4	Development of Plans	LS	$15,000	1	$15,000	LS	$15,000	1	$15,000
1.5	Contract Administration - (Bidding and Award)	LA	$7,500	1	$7,500	LA	$7,500	1	$7,500
1.6	Administrative Costs - (Certification of Final Cover and Closure Notice)	LS	$7,500	1	$7,500	LS	$7,500	1	$7,500
1.7	Project Management - (Construction Observation and Testing)	LS	$25,000	1	$25,000	LS	$25,000	1	$25,000
1.8	Monitor Well Consultant Cost	NA			$0	NA			$0
1.9	Other Environmental Permit Costs	NA			$0	NA			$0
				Engineering Subtotal	62500			Engineering Subtotal	70000

Section 2.0 - Construction

Item	Description	Unit Measure	PHASE III Cost/Unit	No. Units	Total Cost	PHASE IV Unit Measure	Cost/Unit	No. Units	Total Cost
2.1	Final Cover System								
2.1.1	*Site Preparation/ Site Regrading*	ACRE	$1,000	24.0	$23,990	ACRE	$1,000	22.4	$22,350
2.1.2	*Gas Collection Layer(Types*	NA			$0	NA			$0
2.1.3	*Low permeability Layer (Soil - If Applicable)*								
a	Soil Purchase	NA			$0	NA			$0
b	Soil Processing (load)	CY	$0.50	58,055	$29,028	CY	$0.50	54,166	$27,083
c	Soil Transportation	CY	$1.50	58,055	$87,083	CY	$1.50	54,166	$81,249
d	Soil Placement	CY	$1.00	58,055	$58,055	CY	$1.00	54,166	$54,166
e	Soil Amendment	CY	$2.00	58,055	$116,385	CY	$2.00	54,166	$379,162
2.1.4	*Low permeability Layer (Synthetic - If Applicable)*								
a	Geotextile	NA			$0	NA			$0
b	GCL	NA			$0	NA			$0
c	Geomembrane (HDPE/PVC/LLDPE,etc.)	NA			$0	NA			$0
2.1.5	*Drainage Layer (Soil - If Applicable)*								
a	Geotextile	NA			$0	NA			$0
b	Sand/Gravel	NA			$0	NA			$0
2.1.6	*Drainage Layer (Synthetic - If Applicable)*								
a	Geotextile	NA			$0	NA			$0
b	Geonet/Geocomposite	NA			$0	NA			$0
2.1.7	*Erosion Protection Soil Layer*								
a	Soil Purchase	NA			$0	NA			$0
b	Soil Processing (load)	CY	$0.50	58,055	$29,028	CY	$0.50	54,166	$27,083
c	Soil Transportation	CY	$1.50	58,055	$87,083	CY	$1.50	54,166	$81,249
d	Soil Placement	CY	$1.00	58,055	$58,055	CY	$1.00	54,166	$54,166
e	Soil Amendment	CY			$0	CY			$0
2.1.8	*Topsoil Layer*								
a	Soil Purchase	NA			$0	NA			$0
b	Soil Processing (load)	CY	$0.50	19,352	$9,676	CY	$0.50	18,055	$9,028
c	Soil Transportation	CY	$1.50	19,352	$29,028	CY	$1.50	18,055	$27,083
d	Soil Placement	CY	$1.50	19,352	$29,028	CY	$1.50	18,055	$27,083
e	Soil Amendment	NA			$0	NA			$0
2.1.9	*Revegetation*								
a	Seeding	ACRE	$800	24.0	$19,192	ACRE	$800	22.4	$17,904
b	Fertilizing	ACRE	$800	24.0	$19,192	ACRE	$800	22.4	$17,904
c	Mulch	ACRE	$200	24.0	$4,798	ACRE	$200	22.4	$4,476
d	Tackifier	ACRE	$200	24.0	$4,798	ACRE	$200	22.4	$4,476
2.2	Stormwater Protection Structures								
a	Culverts	EA	$1,500	1	$1,500	EA			$0
b	Pipes	NA	$900	10	$9,000	NA			$0
c	Ditches/Berms	FT	$2,500	5	$17,500	FT	$2,000	5	$10,000
d	Detention Basins	NA			$0	NA			$0
2.3	Gas Collection System								
a	Design	NA			$0	NA			$0
b	Additional Equipment / Installation	NA			$0	NA			$0
2.4	Leachate Collection System								
a	Design	NA			$0	NA			$0
b	Additional Equipment / Installation	NA			$0	NA			$0
2.5	Groundwater Monitoring System								
a	Monitor Well Installation	NA			$0	NA			$0
b	Monitor Well Abandonment	NA			$0	NA			$0
2.6	Site Security								
a	Lighting, signs, etc	NA			$0	NA			$0
b	Fencing and Gates	NA			$0	NA			$0
2.7	Miscellaneous								
a	Performance Bonds	LS	$22,000	1	$22,000	LS	$22,000	1	$22,000
b	Contract/Legal fees	LS	$5,000	1	$5,000	LS	$5,000	1	$5,000
				Construction Subtotal	$419,416			Construction Subtotal	$471,492

	PHASE III	PHASE IV
Total	$1,011,916	$641,492
10% Contingency	$101,192	$64,149
Subtotal Closure Cost	$1,113,107	$1,033,641
Inflation Factor	1.4859	1.5459
Inflated Closure Cost (2% inflation)	$1,653,966	$1,690,995

Table B-3. Closure costs for phases III & IV.

POST-CLOSURE COSTS (30 YEARS)

Section 1.0 - Engineering

Item	Description	Unit Measure	Cost/Unit	No. Units	Total Cost
1.1	Post-Closure Plan	LS	$5,000	1	$5,000
1.2	Annual Report (including results from gas, leachate, and ground water sampling - details of maintenance performed)	LS	$5,000	30	$150,000
a	Semiannual Site Inspections	LS	$400	60	$24,000
1	Plan Update	LS	$200	30	$6,000
				Engineering Subtotal	$185,000

Section 2.0 - Gas Collection System - Sampling

Item	Description	Unit Measure	Cost/Unit	No. Units	Total Cost
2.1	Sample Collection	LS	$250	60	$15,000
2.2	Sample Analysis	NA			$0
2.3	Report (Part of Annual Report)				
			Gas Collection System - Sampling Subtotal		$15,000

Section 3.0 - Leachate Collection System - Sampling

Item	Description	Unit Measure	Cost/Unit	No. Units	Total Cost
2.1	Sample Collection	NA			$0
2.2	Sample Analysis	NA			$0
2.3	Report (Part of Annual Report)				
			Leachate Collection System - Sampling Subtotal		$0

Section 4.0 - Ground Water Monitoring System - Sampling

Item	Description	Unit Measure	Cost/Unit	No. Units	Total Cost
3.1	Sample Collection	LS	$960	60	$57,600
3.2	Sample Analysis	LS	$7,000	60	$420,000
3.3	Report (Part of Annual Report)				
			Ground Water Collection System - Sampling Subtotal		$477,600

Section 5.0 - Facility Operations and Maintenance

Item	Description	Unit Measure	Cost/Unit	No. Units	Total Cost
4.1	Cover				
a	Soil Replacement	LS	$1,000	30	$30,000
b	Vegetation/Reseeding	LS	$500	30	$15,000
4.2	Storm Water Protection Structures				
a	Ditch and Culvert Maintenance	LS	$500	30	$15,000
b	Berm and Basin Maintenance	LS	$500	30	$15,000
4.3	Gas Collection System				
a	System Operation	NA		30	$0
b	System Repair	LS	$200	30	$6,000
4.4	Leachate Collection System				
a	System Operation	NA		30	$0
b	System Repair	NA		30	$0
4.5	Ground Water Monitoring System				
a	System Operation	NA		30	$0
b	System Repair	LS	$500	30	$15,000
4.6	Site Security				
a	Lighting, signs, etc.	LS	$500	30	$15,000
b	Fencing and Gates	LS	$500	30	$15,000
4.7	Miscellaneous				
			Facility Operations and Maintenance Subtotal		$120,000

Total	$783,600
10% Contingency	$80,360
Total Post-Closure Cost	$883,960

Table B-4. Post-closure cost estimate.

APPENDIX C

Maps and Drawings

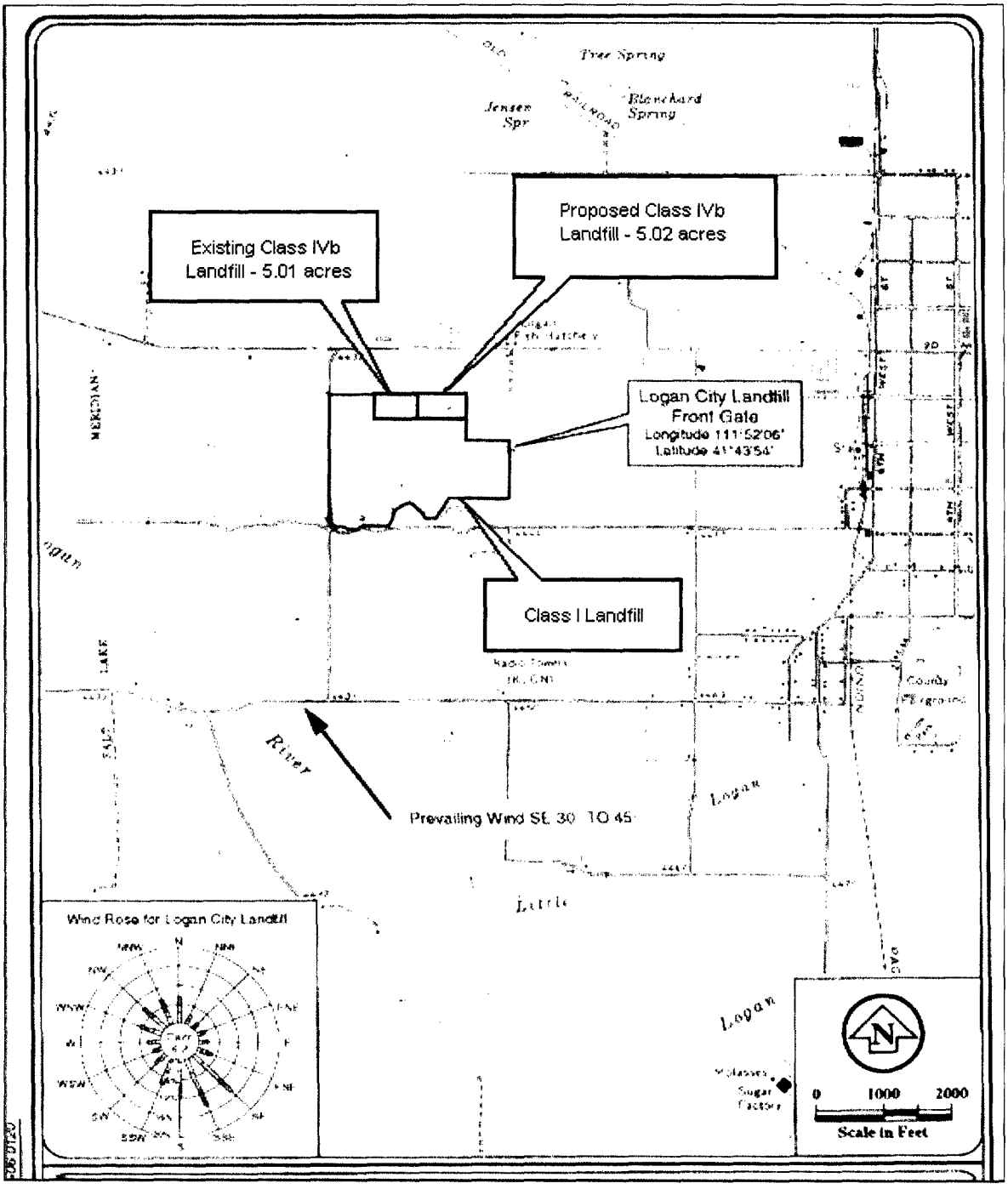


Figure C-1. U.S.G.S. Map, 7 ½ series: Logan City Class I and Class IVb Landfill location map.

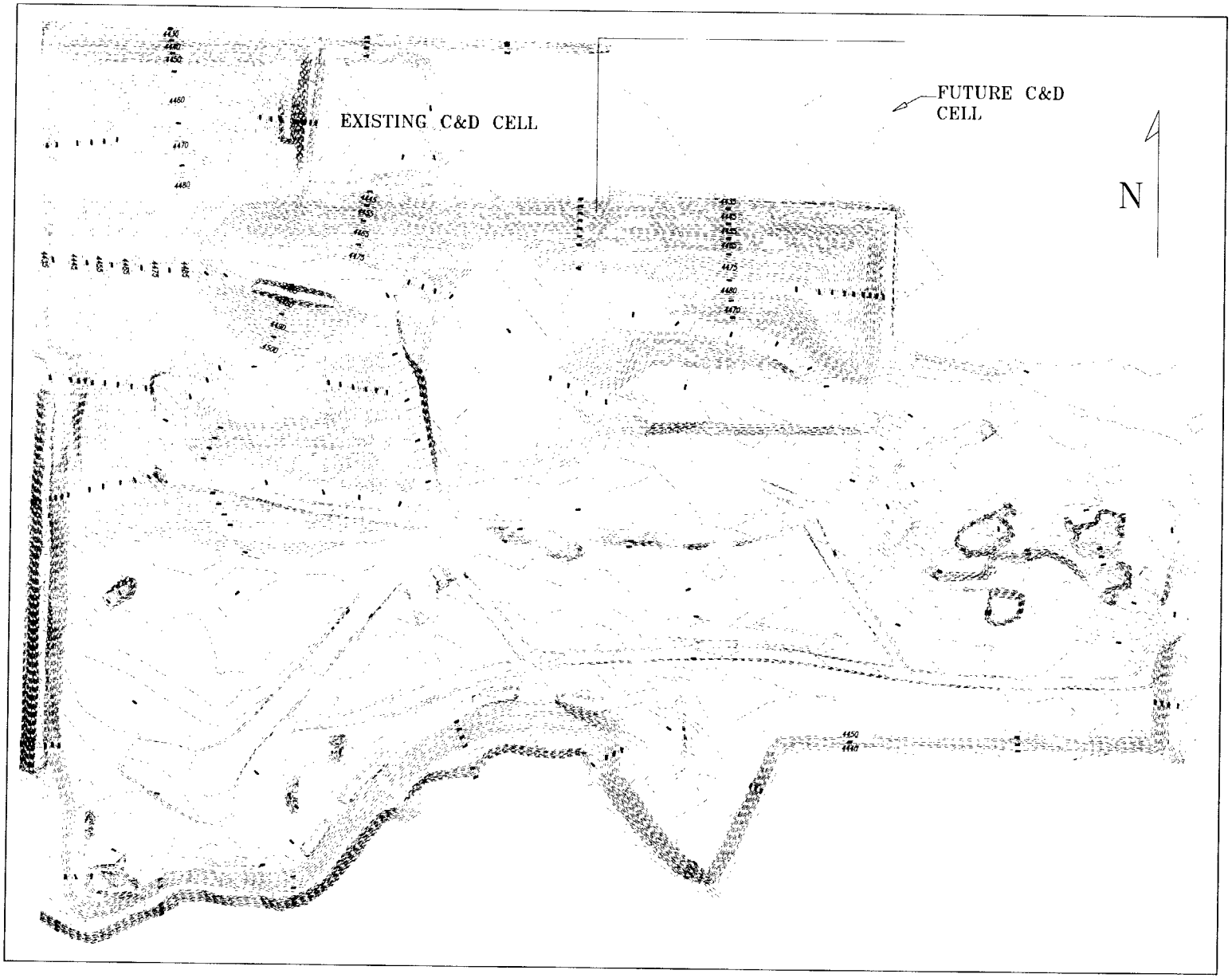


Figure C-2. Topographic Map of Class I and Class IVb landfills (major contours at 5 ft, minor contours at 1 ft).

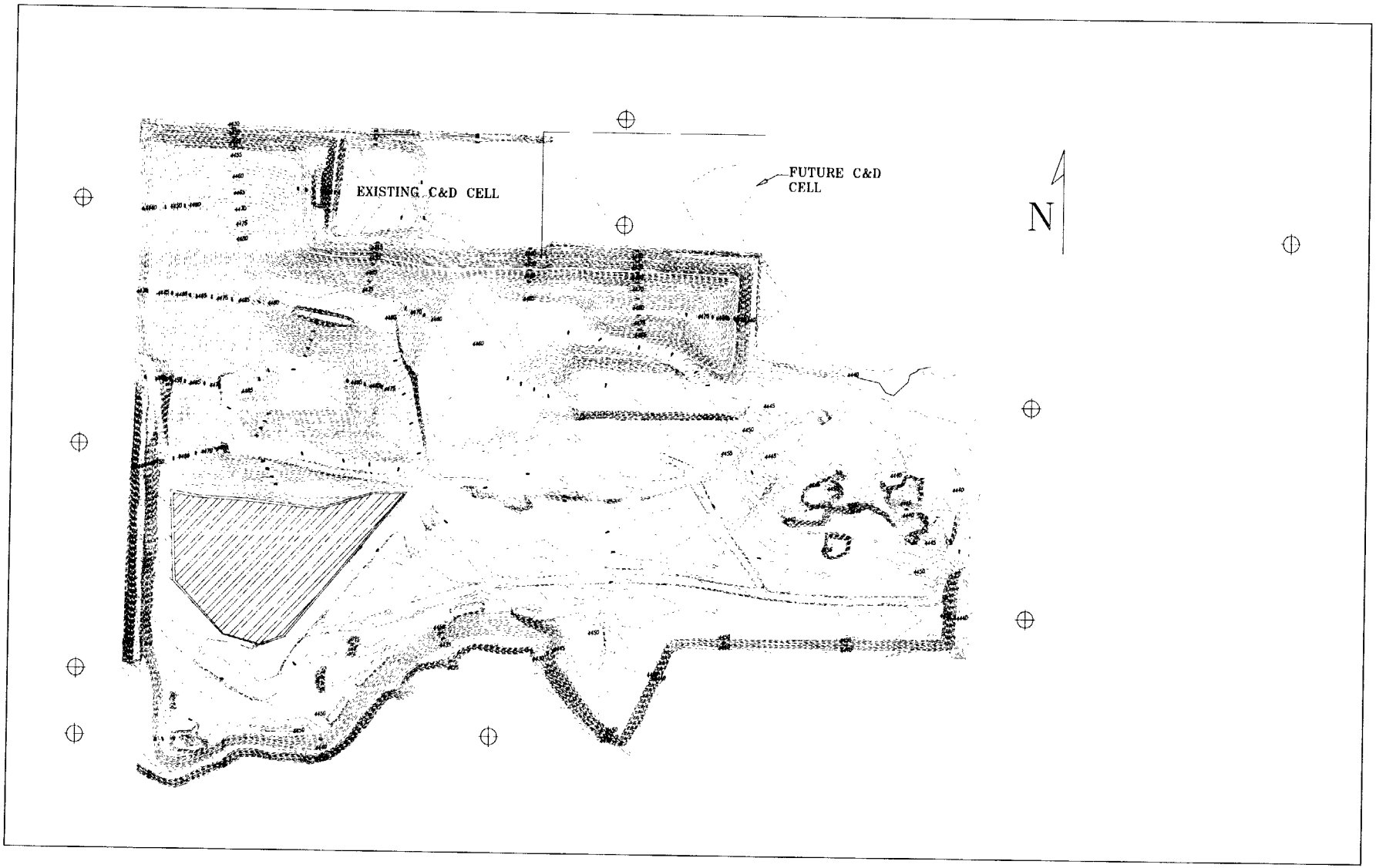


Figure C-3. Location of groundwater monitoring wells. Topsoil storage location shown in red hatch, soil received from local construction project. Additional topsoil borrow areas located directly west of the landfill on city property.

APPENDIX D

Inspection Forms and Recordkeeping

Logan City Landfill
Solid Waste Face
Random Waste Inspection Record

General Report Information

Report ID: 47
Inspector ID: 3965
Name: Martineau, Charles
Title: Landfill Technician

Field Note Number: 2176 Daily Record 1
Date: Saturday, July 12, 2003
Time: 1:10 PM

Vehicle and Owner Information

License: 344XWR State: UT Vehicle Description: Pickup Trailer: None
Gross 0 Tare: 0 Net: 0 Phone: Unknown
Vehicle Owner: Private Driver's Name: Unknown
Address: Unknown Unknown Unknown
Street City Zip

Load Information and Analysis

Generator: Residential Location: Logan
Cardboard ✓ Plastic ✓ Metal Paper Wood ✓ Other Solid Waste: N/A

Analysis Notes
None

Household Hazardous Waste

Characteristic:		Description:	Quantity	Units:
Corrosive:	No	N/A	0	
Flamable / Explosive	No	N/A	0	
Reactive:	No	N/A	0	
Toxic:	No	N/A	0	
Other:	No	N/A	0	

HHW Notes:
None

Special / Restricted Waste

Ash	Animals	Asbestos	Automobile	Construction Demolition
Contaminated Soil	Medical_Waste	Metal / Whitegoods	Refrigeration Units	Tires

Other Special Waste None
Disposal Method and Notes

Suspect Waste

Reason for Suspician: None Other Reasons:
Field Tests Performed: N/A
Tested By N/A
Test_Results: None
Follow UP / Notes:
None

Regulated Waste

Regulated Waste Description:
None
What part of the load was the Regulated Waste found? N/A Photos Taken? No By: N/A
Was Generator/ Hauler Notified No Was State Regulating Agency Notified? No
State Notes:
None
Regulated Waste Notes:
None

Drivers's Description of Waste

Driver Description:
None

Summary

Report Notes:
None
Was Load Accepted? Yes Was Drivers Signature Obtained on Field Notes? No

Form D-1. Sample face inspection form.

Logan City Landfill
Scalehouse Inspections
For
Saturday, July 12, 2003

Inspector	Susan McKee	Title	Scalehouse Attendant	Time	7:12 AM		
License #:	824LXZ	State:	UT	Vehicle Description:	Pickup	Trailer:	None

Household Waste

Antifreeze		Batteries		PCB		Motor Oil		Paint	
Pesticides		Propane Tanks		Refrig		Tires		Other	
Explain Other:									

Inspector	Susan McKee	Title	Scalehouse Attendant	Time	11:14 AM		
License #:	584XCV	State:	UT	Vehicle Description:	Pickup	Trailer:	None

Household Waste

Antifreeze		Batteries		PCB		Motor Oil		Paint	
Pesticides		Propane Tanks		Refrig		Tires		Other	
Explain Other:									

Inspector	Susan McKee	Title	Scalehouse Attendant	Time	11:15 AM		
License #:	621MEV	State:	UT	Vehicle Description:	Pickup	Trailer:	None

Green Waste Waste

Antifreeze		Batteries		PCB		Motor Oil		Paint	
Pesticides		Propane Tanks		Refrig		Tires		Other	
Explain Other:									

Inspector	Tausha Thornton	Title	Scalehouse Attendant	Time	1:11 PM		
License #:	344XWR	State:	UT	Vehicle Description:	Pickup	Trailer:	None

Household Waste

Antifreeze		Batteries		PCB		Motor Oil		Paint	
Pesticides		Propane Tanks		Refrig		Tires		Other	
Explain Other:									

Inspector	Tausha Thornton	Title	Scalehouse Attendant	Time	1:12 PM		
License #:	584LHG	State:	UT	Vehicle Description:	Pickup	Trailer:	None

Green Waste Waste

Antifreeze		Batteries		PCB		Motor Oil		Paint	
Pesticides		Propane Tanks		Refrig		Tires		Other	
Explain Other:									

Inspector	Tausha Thornton	Title	Scalehouse Attendant	Time	1:13 PM		
License #:	9431CT	State:	UT	Vehicle Description:	Pickup	Trailer:	None

Household Waste

Antifreeze		Batteries		PCB		Motor Oil		Paint	
Pesticides		Propane Tanks		Refrig		Tires		Other	
Explain Other:									

Inspector	Tausha Thornton	Title	Scalehouse Attendant	Time	1:18 PM		
License #:	436LMO	State:	UT	Vehicle Description:	Pickup	Trailer:	None

Household Waste

Antifreeze	✔	Batteries		PCB		Motor Oil	✔	Paint	
Pesticides		Propane Tanks		Refrig		Tires		Other	✔
Explain Other:									

Inspector	Tausha Thornton	Title	Scalehouse Attendant	Time	1:20 PM		
License #:	706MCK	State:	UT	Vehicle Description:	Pickup	Trailer:	None

Green Waste Waste

Antifreeze		Batteries		PCB		Motor Oil		Paint	
Pesticides		Propane Tanks		Refrig		Tires		Other	
Explain Other:									

Form D-2. Sample scalehouse inspection form.

Report ID: _

Logan City Landfill
Daily Operational Record Keeping

Daily Transactions

Description	Loads	Tons
Solid Waste Transactions :		
Construction and Demolition Transactions:		
Green Waste tansactions (coming into Compost Yard):		
Green Waste Transactions (leaving the Compost Yard):		
Total		

A total of solid waste loads were directed to the landfill face and a total of random solid waste inspections were conducted

(Inspections / Loads X 100)

A complete random waste inspection shall be conducted at a minimum frequency of 1% of incoming loads, but no less than one complete inspection.

Description	Revenue
Revenue from Solid Waste (Face):	
Revenue From Construction and Demolition	
Revenue From Green_Waste (Sold)	
Revenue From Green Waste (going into Green Waste Yard)	
Other Revenues:	
Total	

Random Face Inspections

Description	Inspections
Total Construction and Demolition Inpections	
Total Solid Waste (Face) Inpections	
Total Green Waste Inpections	
Total Recycling Inpections	
Total Transfer Station Inpections	
Total Total Other Inpections	
Total	

Description	Loads
Total loads containing Special Waste	
Total loads containing Household Hazardous Waste	
Total loads containing Suspicious Waste	
Total loads containing Regulated Waste	
Total	

Random Scalehouse Inspections

Description	Loads
Number of Loads Found to have unacceptable Waste	
Number of Scalehouse Inspections	

Form D-3. Sample daily operating record (front page).

Dust Control

Did you perform any dust control measures today?

If yes, what method/s of dust control measures were used?

Accidents

Was there an accident at the landfill today?

If yes, was City equipment involved?

Vehicle Numbers

Name of person/s involved

Daily Cover

Soil: cubic yards Alternate: cubic yards Spray Cover bags

Household Hazardous Waste Collection

Location of Collection	Material Collected	Quantity	Units	Explain

Summary

Deviations:

Complaints/ Notes:

Signature_____ Signature_____

Landfill Manager Landfill Technician

Form D-4. Sample daily operating record (second page).

APPENDIX E

Run-on/Run-off Control

IGES

Intermountain GeoEnvironmental Services, Inc.

Project No. 00386-002
Logan Landfill
Date 12/4/02 by
Ckd by on

Run-off control ditches

Rational Method $Q_p = ciA$

$i \Rightarrow$ 25 yr / 24 hour storm = 2.48 in/hr from Logan U.S.U station

$c = 0.30$

Area ① = 12.36 acres $Q_p = 0.30(2.48)(12.36) =$ 9.20 cfs

Area ② = 16.60 acres $Q_p = 0.30(2.48)(16.60) =$ 12.35 cfs

Area ③ = 12.60 acres $Q_p = 0.30(2.48)(12.60) =$ 9.37 cfs

Area 4 & 5 = 17.98 acres $Q_p = 0.30(2.48)(17.98) =$ 13.11 cfs

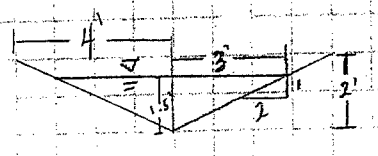
$Q = \frac{1.49 A R^{2/3} S^{1/2}}{n}$

Manning's n (Channel) = (0.02 + 0.005 + 0.015 + 0.010)(1.15) = 0.0575

Slope $\Rightarrow S = 3.5\% = 0.035$ ft/ft (avg for channels)

$R = A/w_p$

$Q = \frac{1.49 A R^{2/3} (0.035)^{1/2}}{0.0575} = 4.85 A R^{2/3}$



$A = 4.5$ ft^2
$w_p = 6.71$ ft
$R = 0.67$ ft

$Q = 4.85(4.5)(0.67)^{2/3}$
$= 16.7$ cfs max
$V = \frac{Q}{A} = \frac{16.7}{4.5} = 3.7$ ft/sec

$\Rightarrow$ for 1.3 ft deep

$A = 3.28$ ft^2
$w_p = 5.81$ ft
$R = 0.58$ ft

$Q = 11.41$ cfs

$V = 3.4$ ft/sec *

2 ft deep, 2:1 (H:V) side slopes

leaves at least 0.5' freeboard on largest area (1, 4 & 5)

Velocity decreases w/ smaller flows.

use same channel for all

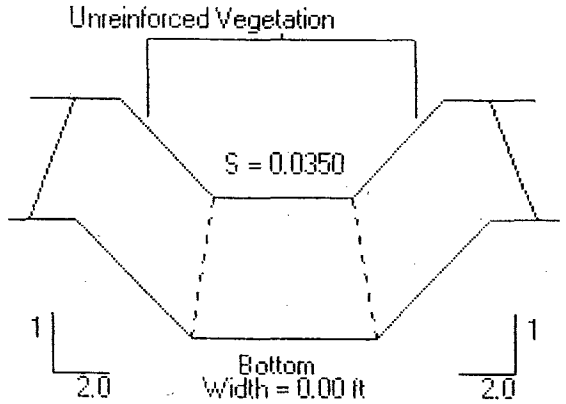
* Check erosion w/ NAG 4.11

North American Green - Erosion Control Materials Design Software Ver.4.11 - Channel	2/5/02	03:13 PM	COMPUTED BY: jh

PROJECT NAME: Logan Landfill		PROJECT NO.: 00386-002	
FROM STATION/REACH: Area 1	TO STATION/REACH: un-lined	DRAINAGE AREA: 12.36 acres	DESIGN FREQUENCY: 25-year

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
9.2	2.0	3.84	2.40	0.49	1.09



Not to Scale

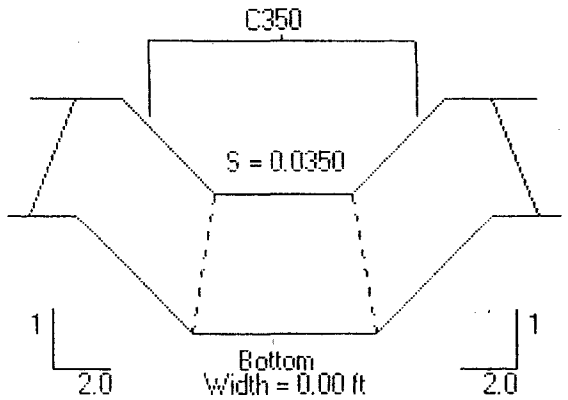
LINER RESULTS

Reach	Material Type / Staple Pattern	Phase / Class	Veg. Type / Veg. Density	Soil Type	Manning's 'n'	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	Unreinforced		Mix		0.045	3.33	2.39	1.39	STABLE
		D	50-75%	Clay Loam		0.050	0.115	0.44	UNSTABLE

North American Green - Erosion Control Materials Design Software Ver.4.11 - Channel	2/5/02	03:12 PM	COMPUTED BY: ih
PROJECT NAME: Logan Landfill		PROJECT NO.: 00386-002	
FROM STATION/REACH: Area 1	TO STATION/REACH: lined	DRAINAGE AREA: 12.36 acres	DESIGN FREQUENCY: 25-year

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
9.2	2.0	4.78	1.93	0.44	0.98



Not to Scale

LINER RESULTS

Reach	Material Type / Staple Pattern	Phase / Class	Veg. Type / Veg. Density	Soil Type	Manning's 'n'	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	C350	1			0.034	3.20	2.14	1.49	STABLE
|	Staple E								

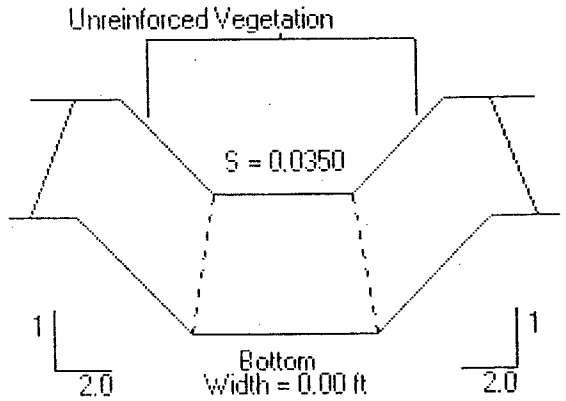
North American Green - Erosion Control Materials Design Software Ver.4.11 - Channel	2/5/02	03:10 PM	COMPUTED BY: ih

PROJECT NAME: Logan Landfill	PROJECT NO.: 00386-002

FROM STATION/REACH: Area 2	TO STATION/REACH: un-lined	DRAINAGE AREA: 16.6 acres	DESIGN FREQUENCY: 25-year.

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
12.4	2.0	4.14	3.00	0.55	1.22



Not to Scale

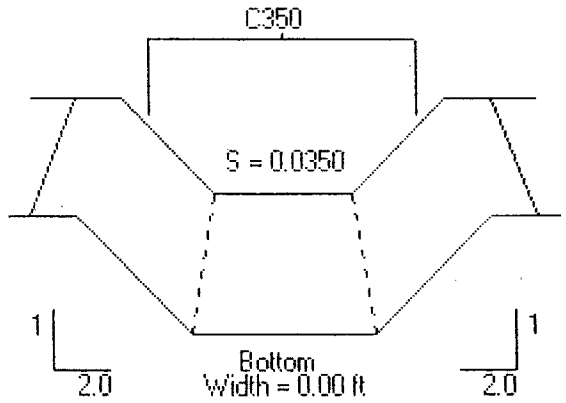
LINER RESULTS

Reach	Material Type / Staple Pattern	Phase / Class	Veg. Type / Veg. Density	Soil Type	Manning's 'n'	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	Unreinforced		Mix		0.045	3.33	2.67	1.25	STABLE
		D	50-75%	Clay Loam		0.050	0.129	0.39	UNSTABLE

North American Green - Erosion Control Materials Design Software Ver.4.11 - Channel	2/5/02	03:09 PM	COMPUTED BY: jh
PROJECT NAME: Logan Landfill	PROJECT NO.: 00386-002		
FROM STATION/REACH: Area 2	TO STATION/REACH: Lined	DRAINAGE AREA: 16.6 acres	DESIGN FREQUENCY: 25-year,

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
12.4	2.0	5.30	2.33	0.48	1.08



Not to Scale

LINER RESULTS

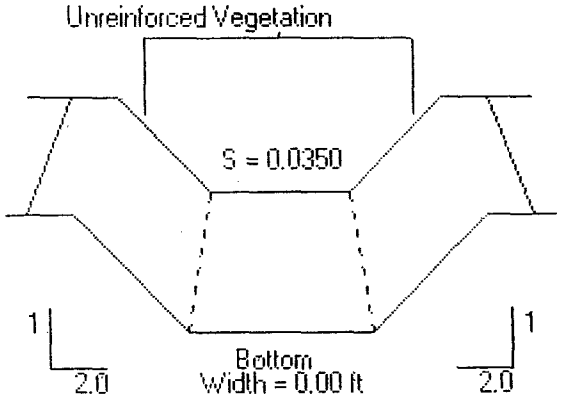
Reach	Material Type / Staple Pattern	Phase / Class	Veg. Type / Veg. Density	Soil Type	Manning's 'n'	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	C350	1			0.032	3.20	2.36	1.36	STABLE
	Staple E								

North American Green - Erosion Control Materials Design Software Ver.4.11 - Channel	2/5/02	03:07 PM	COMPUTED BY: jh

PROJECT NAME: Logan Landfill		PROJECT NO.: 00386-002	
FROM STATION/REACH: Area 3	TO STATION/REACH:	DRAINAGE AREA: 12.6	DESIGN FREQUENCY: 25-year

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
9.4	2.0	3.86	2.44	0.49	1.10



Not to Scale

LINER RESULTS

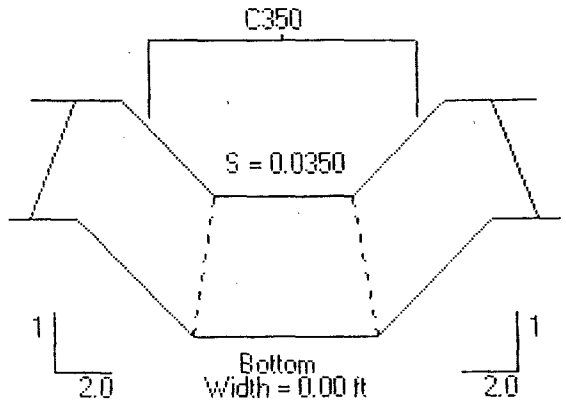
Reach	Material Type / Staple Pattern	Phase / Class	Veg. Type / Veg. Density	Soil Type	Manning's 'n'	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	Unreinforced		Mix		0.045	3.33	2.41	1.38	STABLE
		D	50-75%	Clay Loam		0.050	0.116	0.43	UNSTABLE

North American Green - Erosion Control Materials Design Software Ver.4.11 - Channel	2/5/02	03:08 PM	COMPUTED BY: ih

PROJECT NAME: Logan Landfill		PROJECT NO.: 00386-002	
FROM STATION/REACH: Area 3	TO STATION/REACH: Lined	DRAINAGE AREA: 12.6 acres	DESIGN FREQUENCY: 25-year,

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
9.4	2.0	4.81	1.95	0.44	0.99



Not to Scale

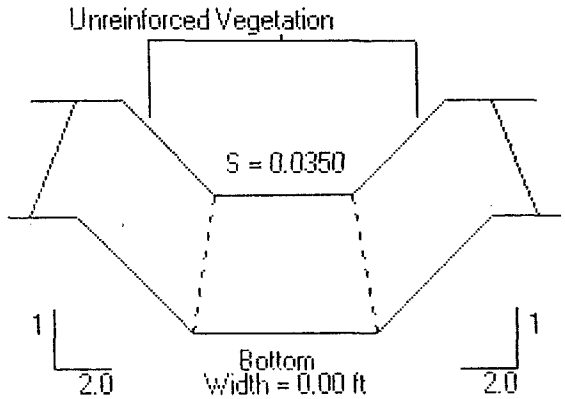
LINER RESULTS

Reach	Material Type / Staple Pattern	Phase / Class	Veg. Type / Veg. Density	Soil Type	Manning's 'n'	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	C350	1			0.033	3.20	2.16	1.48	STABLE
	Staple E								

North American Green - Erosion Control Materials Design Software Ver.4.11 - Channel	2/5/02	03:01 PM	COMPUTED BY: jh
PROJECT NAME: Logan Landfill	PROJECT NO.: 00386-002		
FROM STATION/REACH: Area 4 5	TO STATION/REACH:	DRAINAGE AREA: 17.98 acres	DESIGN FREQUENCY: 25-year

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
13.1	2.0	4.19	3.12	0.56	1.25



Not to Scale

LINER RESULTS

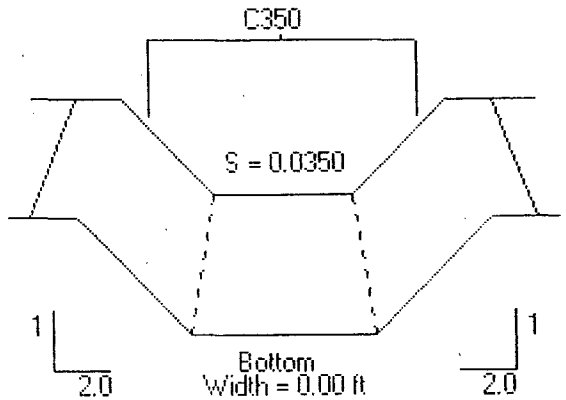
Reach	Material Type / Staple Pattern	Phase / Class	Veg. Type / Veg. Density	Soil Type	Manning's 'n'	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	Unreinforced		Mix		0.045	3.33	2.73	1.22	STABLE
		D	50-75%	Clay Loam		0.050	0.131	0.38	UNSTABLE

North American Green - Erosion Control Materials Design Software Ver.4.11 - Channel	2/5/02	03:03 PM	COMPUTED BY: ih

PROJECT NAME: Logan Landfill		PROJECT NO.: 00386-002	
FROM STATION/REACH: Area 4 5	TO STATION/REACH:	DRAINAGE AREA: 17.98 acres	DESIGN FREQUENCY: 25-year

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
13.1	2.0	5.41	2.42	0.49	1.10



Not to Scale

LINER RESULTS

Reach	Material Type / Staple Pattern	Phase / Class	Veg. Type / Veg. Density	Soil Type	Manning's 'n'	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	C350	1			0.032	3.20	2.40	1.33	STABLE
	Staple E								